FIELD DISTRIBUTION AND ENTRAINMENT OF FISH LARVAE AND EGGS AT THE DONALD C. COOK NUCLEAR POWER PLANT, SOUTHEASTERN LAKE MICHIGAN, 1973-1979

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INTRODUCTION

PURPOSE OF THE STUDY

Mortality induced by entrainment of fish eggs and larvae and impingement of juvenile and adult fishes may be the most important biological influence power generating plants exert on nearshore fish populations. These impacts clearly overshadow thermal discharge effects. Entrainment could significantly affect local Lake Michigan fishes by reducing the reproductive potential of important forage or gamefish populations. Because of this potential impact of the Cook Plant, we have intensively documented species, sizes, and numbers of fish larvae and eggs entrained at the plant from 1975 to 1979. In this report we attempt to identify, interpret, and predict the effects of fish larva and egg entrainment on southeastern Lake Michigan's nearshore fish populations.

Schubel and Marcy (1978) defined two forms of entrainment; intake or pump entrainment and plume entrainment. Intake entrainment is the capture and inclusion of organisms, in our case - fish eggs and larvae, into water used for condenser cooling. Plume entrainment is the attraction or mixing of adults and larvae from lake water near the discharge into the thermal plume. We did not sample plume-entrained eggs or larvae because of difficulties encountered in adequately and safely collecting organisms from this area. Effects of plume entrainment on adults are discussed in the adult and juvenile fish report (see Tesar et al. 1984). In this report, entrainment, unless otherwise noted, will refer specifically to intake entrainment.

To more clearly define the effects of entrainment on southeastern Lake Michigan's fish community, we must (in addition to documenting species, sizes, and numbers entrained) relate those losses to the distribution, abundance, and life cycles of fishes near the Cook Plant and assess the associated effects on individual fish populations and community structure. The ultimate effect of entrainment losses will be dictated by the system's "resiliency," i.e., environmental stability, productivity, population compensation, and the ecological and economic importance of individual species. To attain these goals, we conducted field studies to identify the species, sizes, numbers, spatial distribution, and seasonal occurrence of adult fish, fish larvae, and eggs near the Cook Plant.

Most fishes in our study areas have similar seasonal movement patterns, most often related to spawning activity. They move inshore for spawning in early spring or summer where some

species remain until moving into deeper water in the fall. Salmon, trout, and coregonids differ from this basic pattern and are usually present during spring, fall, and upwellings. Entrainment losses usually peak during and shortly following spawning and are sporadic thereafter. Mortality of eggs and larvae during entrainment is the result of a combination of mechanical, thermal, and chemical stresses.

STUDY AREA

The Donald C. Cook Nuclear Power Plant occupies part of a 263-ha site on the southeast shore of Lake Michigan that includes approximately 1,326 m of sand dunes shoreline. The plant is located approximately 3.2 km northeast of Bridgman, Michigan, in Lake Township, Berrien County (Fig. 1).

With both reactors on line, the Cook Plant has a generating capacity of 2,200 megawatts of electricity. The plant utilizes a once-through cooling system capable of a maximum service water flow rate of 104 m^3/s to dissipate an estimated heat rejection rate of 3 X 10^{12} calorie g/h (AEC 1973). Condenser design modifications account for differential flow rates for Unit 1 (45 m^3/s) and Unit 2 (59 m^3/s). Temperature increases (Δ T) over ambient lake water temperatures are 12.1C° (Unit 1) and 9.3C° (Unit 2) at maximum generating capacity (AEC 1973). Decreased flow rates and slightly increased Δ Ts occur in winter when heated water is pumped back through the intake structures via one of the three intake pipes to reduce ice formation.

Water for both condenser units is drawn from Lake Michigan through three intake structures 686 m offshore in 7.3 m of water (mean lake level - 176.5 m above sea level). Intake structures rest on a concrete and riprap base structure approximately 2 m above lake bottom. Intake openings, protected by a series of steel guard racks, are an additional 2.5 m above the base. Therefore, intake water is drawn from the 2- to 5-m strata of the water column. Three intake pipes with diameters of 4.9 m are buried in the lake bottom and covered by at least 0.6 m of sand (AEC 1973). Estimated water velocity at the intake grills (20 X 20-cm openings) is approximately 0.4 m/s during normal conditions and 0.6 m/s during winter de-icing operations. In the intake pipes, water velocity increases to 1.8 m/s during normal conditions (AEC 1973). Cooling water travels through the intake pipes to a common screenhouse where the seven circulating water pumps are located (Figs. 2 and 3).

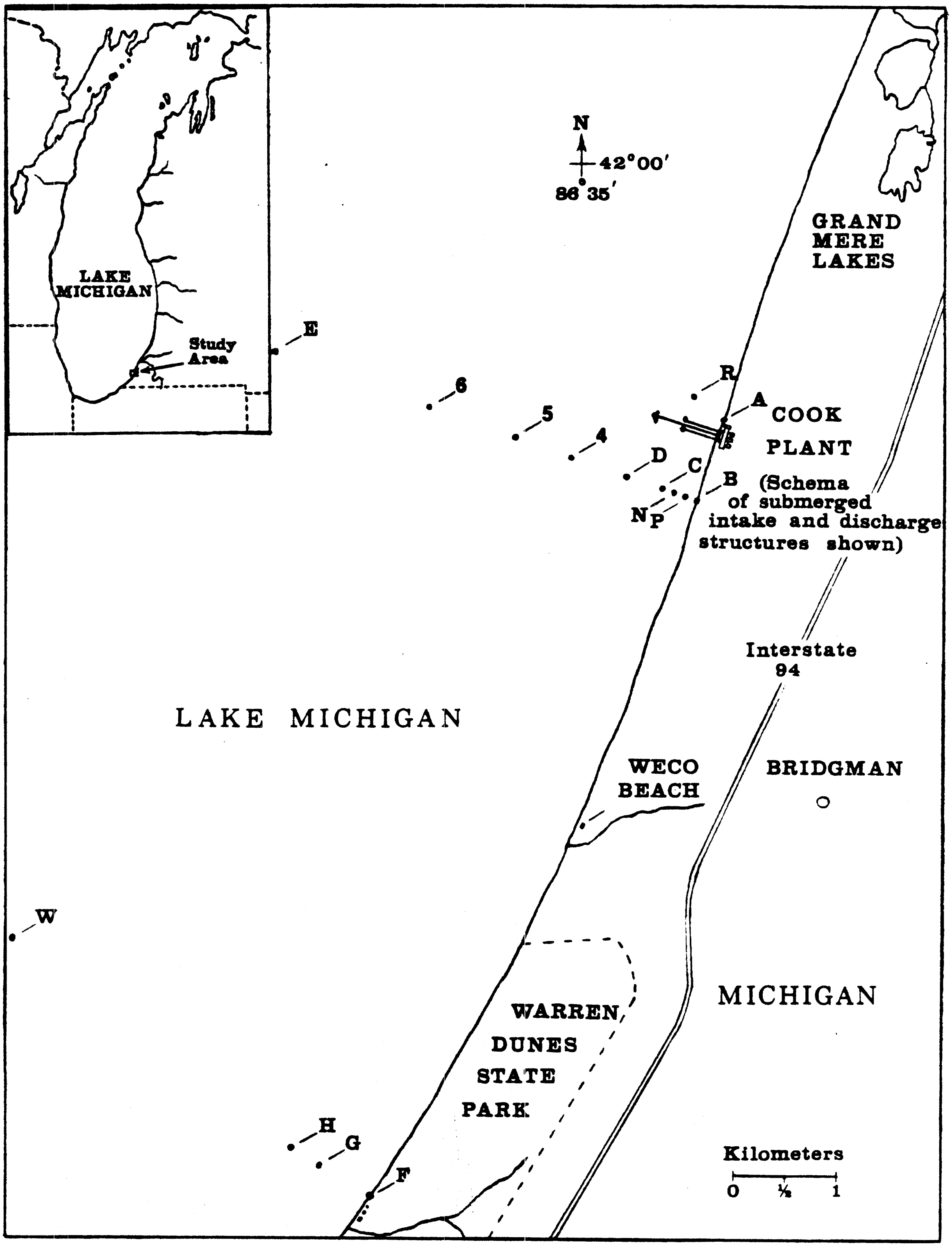


Figure 1. Map of southeastern Lake Michigan, showing locations of the D. C. Cook Plant and our field fish larvae sampling stations.

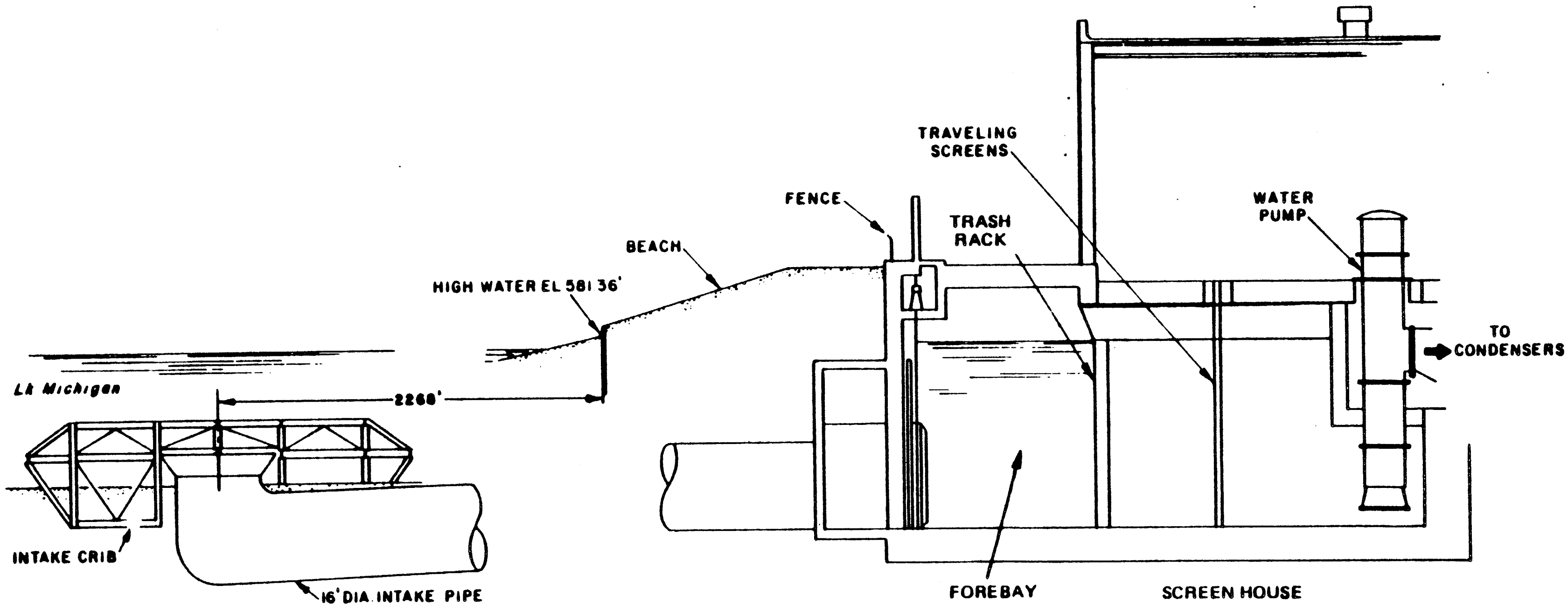


Figure 2. Scheme of the intake crib and screenhouse at the D. C. Cook Plant, southeastern Lake Michigan. Adapted from AEC (1973).

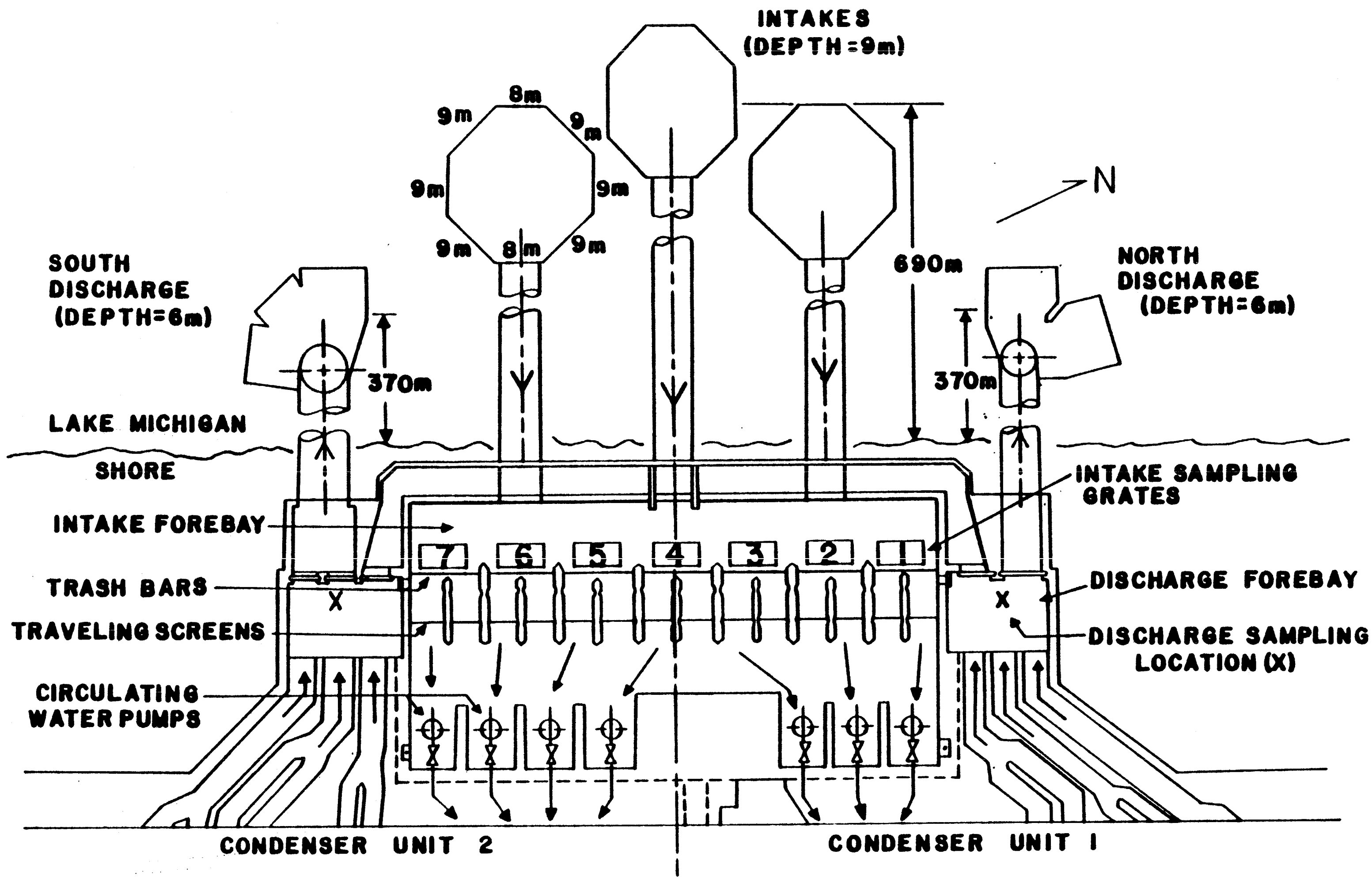


Figure 3. Diagram of the screenhouse and the plant's intake-discharge pipes in Lake Michigan. Also shown are the traveling screens, circulating water pumps, and forebay grates where entrainment sampling was conducted.

Water then passes through vertical trash racks (6 to 7-cm openings, 0.3 m/s water velocity) and vertical traveling screens (0.95-cm square openings, 0.6 m/s water velocity) to circulating water pumps and condensers. Heated water is discharged via two buried pipes (4.9-m diameter). Discharge structures are 91 m apart and 366 m offshore in 5.5 m of water. Water is discharged through slot-jet diffusers at a high rate (6,202 m^3/min) which rapidly mixes heated and ambient water. The effluent plume has an estimated area during two-unit operation of 230 ha within the 1.7C° Δ T (3F°) isotherm (AEC 1973). A more detailed discussion of intake and discharge structures may be found in Jude et al. (1979), AEC (1973), and Indiana & Michigan Electric Company (IMEC) (1977, 1979). Cooling water passage time from intake at the 7.3-m contour in Lake Michigan to discharge at the lake's 5.5-m contour is approximately 10 min; duration of condenser passage is about 6 s (AEC 1973).

METHODS

FIELD LARVAE

Sampling

Fish larvae were collected with a conical, 0.5-m diameter, nylon plankton net of no. 2 (363-μm) mesh. A Rigosha flowmeter attached to the center opening of the net measured volume of water sampled. When flowmeters failed to function, the average of flowmeter values from the remaining tows at the same station or from stations of comparable depth were substituted. Flowmeter readings were converted to volume filtered by use of the calibration method described in Jude et al. (1979b).

Duplicate surface tow samples were collected at beach seining stations A (north Cook), B (south Cook), and F (Warren Dunes). A net was towed by hand, just below the water surface, against the current for a distance of about 61 m once during the day and once at night. Beach tows were performed once a month, April through November.

Horizontal, 5-min tows from the R/V Mysis at speeds of 3-6 km/h at discrete depths parallel to shore along three transects in Lake Michigan were conducted. The transects were at Warren Dunes, including stations F (1 m, i.e., beach), G (6 m), H (9 m), and W (21 m); south Cook, with stations B (1 m), C (6 m), D (9 m), and E (21 m); and north Cook, with stations A (1 m) and R (6 m) (Fig. 1). Open water tows were performed both day and night, once per month, April through September. For 6-m stations, tows were done at 0.5, 2, 4, and 5.5 m; for 9-m stations, depths were 0.5, 2.5, 4.5, 6.5, and 8.5 m; and for 21-m stations, tows were done at 0.5, 7.5, 13.5, and 20 m. Tow depths and durations differed slightly in 1973 as tows were conducted at 0, 1, and 2 m and a steptow was also performed from the bottom to the surface; see Jude et al. (1979b) for details. Stations R (6 m, north Cook) and W (21 m, Warren Dunes) were not sampled in 1973 or 1974. Station M (6 m, off St. Joseph River) was sampled in 1973 only and south Cook stations N (3 m), 4 (12 m), 5 (15 m), and 6 (18 m) were sampled in 1976 only.

The procedure for deepwater tows was as follows:

1) Plankton net with attached Mason jar and depressor lowered to desired depth on end of cable.

2) Plankton net towed horizontally for 5 min starting at the desired depth, which was obtained by measuring cable angle and trigonometrically calculating the length of cable to be released to reach desired depth.

3) Plankton net hauled to surface and washed with a water hose.

4) Contents rinsed into the Mason jar, preserved with 40 mL of buffered formaldehyde, labelled, and sealed.

Fish larvae samples were collected from the lake bottom using a benthic sled (Yocum and Tesar 1980) equipped with a flowmeter. A no. 2, 363-μm mesh net mounted in a rectangular frame sampled within 5 cm of bottom. Tows were performed once during the day and once at night at beach stations A, B, and F, and open water stations C, D, N, and P during regular monthly sampling periods in 1974. See Jude et al. (1979b) for details of sampling procedure.

Total numbers of larvae and eggs captured in all subsurface tows were adjusted to compensate for upper strata contamination. For details of calculation see Jude et al. (1979b). Numbers of eggs and larvae were converted to densities, i.e., number/1,000 m^3, for all analyses. About 35 m^3 of water were filtered in most tows.

Statistical Analyses

Analysis of variance (ANOVA)(α = 0.01) was applied to larval fish density data (no./1,000 m^3) of three species: alewife, yellow perch, and spottail shiner. All ANOVA designs were Model I, full factorial, balanced designs calculated with the statistical package BMD8V (Statistical Research Laboratory 1975). To approach the assumptions of the model more closely, larval fish densities were transformed using log (density + 1). Data from two zones, beach and open water, were analyzed separately. Factors used in ANOVA applied to larval fish density data in the beach zone included Year (1973 through 1979), Month (June through August), Station (A, north Cook; B, south Cook; and F, Warren Dunes), and Diel Period (day and night) for alewife and spottail shiner. Factors used in the open water zone included Year, Month, Area (Cook and Warren Dunes), Depth (6- and 9-m contour), and Diel Period for alewife, and Year, Area, Depth, and Diel Period for yellow perch. Only density data from the month of June were used in yellow perch ANOVA.

Because preliminary tests showed no significant trend in larval fish densities among depth strata (surface to near bottom) for a given sampling site and time, samples from different depth strata from the same site and time (day or night) were used as replicates in the ANOVAs of open water stations. Because larval fish samples were taken at 2-m intervals in open water, stations at 6 m, (C, south Cook, and G, Warren Dunes) had one less replicate than 9-m stations (D, south Cook, and H, Warren Dunes). To balance the design, the mean of densities from the four strata at 6-m stations replaced the missing 8-m value. The unweighted means method for balancing designs (Fox 1973) was then applied to the open water results. Treatment sums of squares were multiplied by the ratio of harmonic mean cell size to maximum cell size to adjust for substitutions, and the number of missing values was subtracted from degrees of freedom of the error term to adjust mean square error.

The unweighted means method of adjustment was used for samples that were lost because of inadequate preservation or not collected due to inclement weather. The mean of densities of the remaining replicates at a station was substituted for the missing value; densities from comparable stations and depth strata were used when multiple samples from a station were missing. The following missing samples required substituted values in the ANOVA:

1) June 1973, 1 m, day, station C.

2) August 1974, 0.5 m day, station H; 2 m, night, station G; 8 m, night, station H.

3) June 1976, 0.5 m, 2 m, 4 m, 6 m, night, station C; 8 m, night, station D.

Changes in abundance of larvae as they grew were estimated by the method of Cada and Hergenrader (1980). Density of larvae caught in each 0.5-mm interval of total length was plotted against densities summed across monthly sampling periods and years. Curves were smoothed by grouping data into 2-mm intervals.

Field-Entrainment Comparison

We compared densities of fish eggs in field and entrainment samples using the following method. First, we computed density for each diel period (two) of field sampling as the mean of densities at stations C, D, and R, where density at each station was the mean of replicates (four at 6-m stations C and R, five at

9-m station D). The density computed for each diel division of entrainment sampling was the mean of four replicates. Density reported for each diel period (day or night) was the mean of two sets of samples (eight total), namely dusk-midnight and midnight-dawn for nighttime density and dawn-noon and noon-dusk for daytime density. Thus each diel comparison each month was based on 13 field and 8 entrainment samples.

To compare annual trends in egg abundance in field and entrainment samples, we recorded total density each year. Total density was the sum of densities in the monthly sampling periods, May through August. We summed day and night sample densities to obtain totals for each month. We used Spearman rank correlation tests to compare abundance ranks of eggs in field and entrainment samples. Rank correlation coefficients were computed by ranking mean densities each year.

ENTRAINMENT

Sampling

Species and numbers of larvae and eggs entrained at the Cook Plant have been monitored by standardized sampling since 1973. However, sampling in 1973 and 1974 was limited because of the sporadic testing of condenser cooling systems. These data are presented in detail in Jude et al. (1979b). This report analyzes data collected during operational years 1975 to 1979. In 1975, supplemental sampling was undertaken to examine vertical and horizontal stratification of eggs and larvae in the intake forebay.

An entrainment sampling unit included a Hale (type 30LC-1750) diaphragm pump (maximum capacity, 300 liters per minute; mean capacity, 208 liters per minute) with a 7.6-cm diameter hose extending into the intake forebay to a depth of 5 m (Fig. 4). The 5-m depth (maximum depth in the forebay is 9 m) was chosen because of results of our vertical and horizontal stratification testing in 1975 (Jude 1976). Water was pumped through a 0.5-m diameter, no. 2 Nitex nylon, 363-μm mesh plankton net suspended in a 208-l drum. A flowmeter installed in the drum's effluent pipe measured the volume of water filtered. Standard entrainment sampling units were located at grates 2, 3 north, 3 south, and one at the Unit 1 discharge (Fig. 4). Seven grates span the length of the screenhouse forebay floor. Most sampling in 1975-1979 was done at grates 2 and 3. Unit 1 circulation pumps draw most of their water under grates 1, 2, and 3 (Fig. 3).

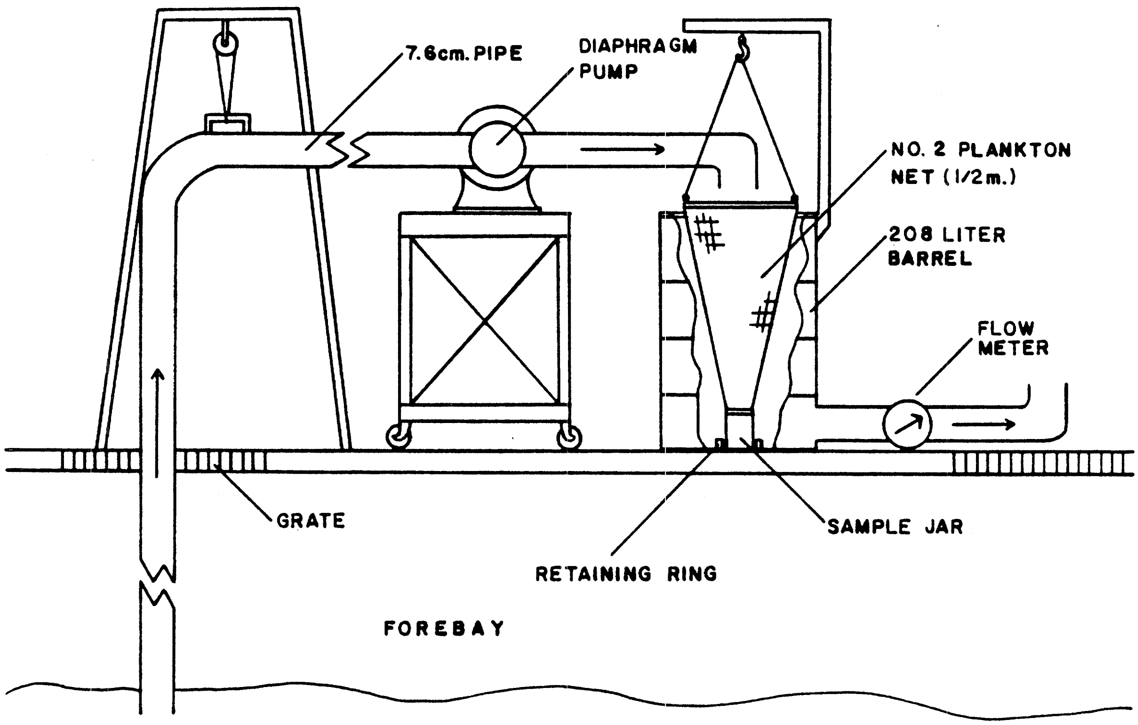


Figure 4. Schematic diagram of an entrainment sampling unit, showing the forebay, sampling pipes, diaphragm pump, plankton net, and flowmeter in the discharge pipe.

Standard series entrainment samples were collected twice per month, except for June, July, and August when sampling was done once per week to coincide with peak abundance of larvae. Samples were collected over a 24-h period. Each 24-h period was divided into four diel sampling divisions which varied from 4 to 8 h, depending on division and day length. The four divisions were sunrise-noon, noon-sunset, sunset-midnight, and midnight-sunrise. Sixteen samples, four replicates (three intake, one discharge) per division, were collected for each 24-h period.

Supplemental sampling was conducted in 1975 to measure differences in the horizontal and vertical distribution of eggs and larvae in the forebay and to help establish validity of sampling location and depth. This study is described in detail by Jude (1976), but will be briefly discussed here. For the depth study, an analysis of variance (ANOVA) design with three depths (2, 5, and 8 m) and six time periods (2300-0300, 0300-0700, 0700-1100, 1100-1500, 1500-1900, 1900-2300) with days (29-31 July 1975) as a random factor was used. Similarly, for the grate study there were three grates (grate 2, 5, and 7) and six time periods with days as a random factor (31 July-2 August

1975). See Figure 3 for details of the locations of these sampling areas. The depth study was conducted at grate 3 and the grate study was conducted at 5 m. All samples from the depth-grate study were 4-h duration (about 38 m^3 of water was pumped per sample).

The original entrainment data from the 1975 depth-grate study were reexamined and updated with new taxonomic information. Some changes were made, but in general they had minor impact on our original analyses. Changes included reassignment of some species identifications, and all samples were rechecked for missed larvae and eggs. Additionally, data collected during standard series entrainment sampling from 1975 to 1979 were examined for indications of differences in the distribution of larvae and eggs in forebay waters, pump avoidance by larvae, destruction of larvae during condenser passage, and sampling adequacy.

Densities of larvae and eggs represent a conversion of number per volume sampled (the amount of water pumped through the plankton net) to number per standardized volume (1,000 m^3). These standardized mean densities of larvae and eggs were expanded to the volume of water circulated by the plant during the time represented by that diel period. The total number of fish and eggs entrained over 24 h was computed by totaling estimates from each of the four diel sample divisions during a sample period. Each of these four estimates was derived by multiplying the mean density (n = four) times the total volume of water pumped through the plant during the time represented by that particular division. For yearly estimates, non-overlapping, contiguous time intervals (usually 1-2 wk) were established such that the sampling date was the approximate midpoint of the interval. Estimated entrainment during a sampling period was assumed to be representative of fish larvae and egg abundance per unit volume of circulating water during the 1-2-wk sample interval. The estimated number of fish larvae and eggs entrained was expanded accordingly. These data were totaled for each month and then yearly estimates computed.

Sample Types

The Cook Plant entrainment sampling regime has been modified several times during the course of this study. Four classes of samples describe the use or type of sample collected: standard, supplemental, processed but not used, and not processed (discarded or lost). For a summary of entrainment sampling locations and effort from 1975 to 1979 see Results and Discussion, Entrainment - Sampling Adequacy.

Standard series samples were those that could be compared with others in terms of location, duration, and frequency of sampling. Standard samples were collected from grates 2 and 3, and from either the Unit 1 or Unit 2 discharge during any of four diel periods (midnight to sunrise, sunrise to noon, noon to sunset, or sunset to midnight); depth was 5 m. Volume of water filtered for each sample must have been consistent with volumes of other standard samples collected during the same diel period. A complete standard series sampling set resulted in the collection of 16 samples, 4 samples (3 intake, 1 discharge) from each of the four diel periods. At least one, but usually two standard series sampling sets were collected every month from July 1976 to December 1979, except during January and February 1977 when the plant was not operating. Additional standard series samples were collected weekly during June, July, and August of most years. Prior to July 1976, sampling at grate 3 and the Unit 1 discharge represented standard samples.

Supplemental samples were those taken to examine the vertical and horizontal stratification of fish larvae and eggs in the forebay; samples extending across diel periods (i.e., samples taken all night, all day, noon to midnight, midnight to noon, or for 24 h); samples for which inadequate data concerning location of sampling were recorded; and samples taken from grates other than 2, 3, or Unit 1 discharge. Data from supplemental samples were used to support conclusions concerning heterogeneity in the distribution of larvae and eggs in the forebay and to increase the entrainment data base for improving estimates of entrainment losses.

Laboratory samples which were not comparable to other samples collected during the same time period were removed from the analyses. These samples included: (1) samples in which volumes of water filtered were substantially reduced (less than 75 liters per minute), (2) reduced sampling duration (usually as a result of pump or power failure), or (3) any other problem samples. Samples which were lost, broken, or inadequately preserved comprised this final category. These samples were noted but not included in the entrainment data base.

LABORATORY PROCEDURES

All entrainment and field samples of fish larvae and eggs were preserved with a 10% formaldehyde solution immediately after collection and then transported to the Great Lakes Research Division's Fishery Laboratory for analysis. For our purposes, fish larvae were defined as any fish 25.4 mm or less in total length (TL). In the laboratory, larvae were sorted, identified,

counted, and measured. Larvae were identified to species, when possible, otherwise to the lowest taxonomic group (see Table 1). Alewife, spottail shiner, and rainbow smelt were measured to the nearest 0.5 mm TL, while all others were measured to the nearest 0.1 mm TL. Eggs were also counted but not identified to species. When large quantities were found, egg numbers were estimated via a volumetric subsampling method (see Jude et al. 1975). All larvae and a subsample of eggs from each entrainment sample were then catalogued and saved for future reference. Data were recorded directly on standard coding forms, keypunched, and transferred to computer tapes for analysis.

Table 1. Ichthyoplankton species and groups entrained or collected in the vicinity of the Cook Plant from 1973 to 1979. Scientific names from Robbins et al. (1980).

Common name or category	Code	Scientific name or category
Alewife	AL	*Alosa pseudoharengus* (Wilson)
Spottail shiner	SP	*Notropis hudsonius* (Clinton)
Rainbow smelt	SM	*Osmerus mordax* (Mitchill)
Yellow perch	YP	*Perca flavescens* (Mitchill)
Trout-perch	TP	*Percopsis omiscomaycus* (Walbaum)
Johnny darter	JD	*Etheostoma nigrum* Rafinesque
Slimy sculpin	SS	*Cottus cognatus* Richardson
Common carp	CP	*Cyprinus carpio* Linnaeus
Ninespine stickleback	NS	*Pungitius pungitius* (Linnaeus)
Mottled sculpin	MS	*Cottus bairdi* Girard
Deepwater sculpin	FS	*Myoxocephalus thompsoni* (Girard)
Burbot	BR	*Lota lota* (Linnaeus)
Quillback	QL	*Carpiodes cyprinus* (Lesueur)
Unidentified sculpins	UC	*Cottus* spp.
Unidentified minnows	XM	Cyprinidae
Unidentified coregonids	XC	*Coregonus* spp.
Unidentified darters	XE	*Etheostoma* spp.
Unidentified suckers	XS	Catostomidae
Unidentified clupeids	XH	Clupeidae
Unidentified fish larvae as a result of poor condition	XP	
Unidentified fish larvae	XX	
Fish eggs		

Larval fish identification was based on knowledge of species abundance and spawning times in southeastern Lake Michigan, comparison of specimens with those in the Great Lakes Regional Fish Larvae Collection (Dorr and Jude 1981), and reference to taxonomic works (Lippson and Moran 1974, Nelson and Cole 1975, Dorr et al. 1976, Hogue et al. 1976, Jude et al. 1979b, and Auer 1982). Some fish larvae identifications may be reevaluated and reassignments made, but these taxonomic changes will not affect total entrainment estimates in any year.

RESULTS AND DISCUSSION

FIELD DISTRIBUTION OF FISH EGGS AND LARVAE

General Trends

Fifteen taxa of fish larvae were identified from our field samples during the 7-yr study. Alewife (*Alosa pseudoharengus*) dominated collections in every year. Spottail shiner (*Notropis hudsonius*), yellow perch (*Perca flavescens*), and rainbow smelt (*Osmerus mordax*) were also present in all years, but in much smaller numbers than alewife. Burbot (*Lota lota*), trout-perch (*Percopsis omiscomaycus*), common carp (*Cyprinus carpio*), and johnny darter (*Etheostoma nigrum*) appeared in field samples occasionally. The remaining seven taxa, deepwater sculpin (*Myoxocephalus thompsoni*), slimy sculpin (*Cottus cognatus*), ninespine stickleback (*Pungitius pungitius*), unidentified minnows (Cyprinidae), unidentified suckers (Catostomidae), unidentified herring (Clupeidae), and unidentified sculpins (*Cottus* spp.) were extremely rare; each was present in only 1 or 2 yr.

Larvae first appeared in samples in April (1973, 1975, 1976, 1978) or May (1974, 1977, 1979), and became most abundant during the summer months (June-August), when spawning was greatest. The last larvae of the season were collected in September (1973, 1976), October (1974, 1975, 1979), or November (1977, 1978). Smelt, burbot, yellow perch, deepwater sculpin, and alewife were among the earliest larvae to appear during our field season; alewife, and occasionally trout-perch, were the latest.

June, July, and August samples contributed between 80 and 99% of the total number of larvae collected in each year. July was usually the month of highest mean densities of larval fish at both beach and open water stations, followed by June, and then August. During the summer, monthly mean densities were consistently higher at beach stations than at open water stations (except for June 1974 and June 1977).

Alewife

General abundance trends--

In the beach zone, alewife was most abundant in 1973 and least common in 1979. Geometric mean densities (no. per 1,000 m^3) from 1973 through 1979, averaged over June-August, were 3,340, 180, 500, 330, 190, 270, and 40, respectively. In the

open water zone, the year of peak abundance was 1974, and the year of lowest abundance was 1978. Geometric mean densities in open water from 1973 to 1979 were 120, 520, 210, 30, 30, 5, and 40, respectively. Mean densities differed significantly among years at both beach and open water stations (ANOVA; $P < 0.0001$ at both sets of stations). Mean abundance did not differ significantly between Warren Dunes and Cook Plant (ANOVA; beach: $P = 0.19$; open water: $P = 0.15$), implying no detectable plant effect.

Seasonal occurrence --

Occurrence of alewife larvae in the study area was distinctly seasonal, corresponding with the period of higher water temperatures, chiefly June through August or September (Figs. 5-11). Field samples in these 4 mo produced 95-100% of the larvae collected each year. Over the years, first appearance of alewife larvae in field samples was usually in June, although in 1979, a year of relatively colder water temperatures (Table 2, Fig. 11), it did not occur until July. Peak abundance of alewife larvae at beach stations was in June (1974, 1975, 1976) or July (other years). At open water stations, July usually produced the highest mean densities of larvae, although August was the peak month in 1977 and 1978. The month of highest density often differed between beach and open water stations. Peak densities at open water stations were often later (1975, 1976, 1977) and rarely earlier (1973) than peak densities in the beach zone. Last collection of larvae in field samples was normally in September or October, with an extreme of November in 1977 (Figs. 5-11).

Occurrence of maximum larval alewife abundance was a month earlier in 1973-1976 than in 1977-1979, with maximum densities in June in earlier years and July in later years. The difference in timing of peak abundance presumably occurred because early June temperatures were high enough to induce spawning before our June sampling period in 1973-1976 but were too low in 1977-1979 (Table 2).

Vertical distribution--

The pattern of distribution of alewife larvae across depth strata was examined in detail for 6-m stations C (Cook) and G (Warren Dunes) and 9-m stations D (Cook) and H (Warren Dunes) for 1974-1979 but not for 1973, when tow depths differed, nor for beach stations A, B (Cook), and F (Warren Dunes), where collections were taken at only one depth. At both 6-m and 9-m stations, two conspicuous features of vertical distribution were

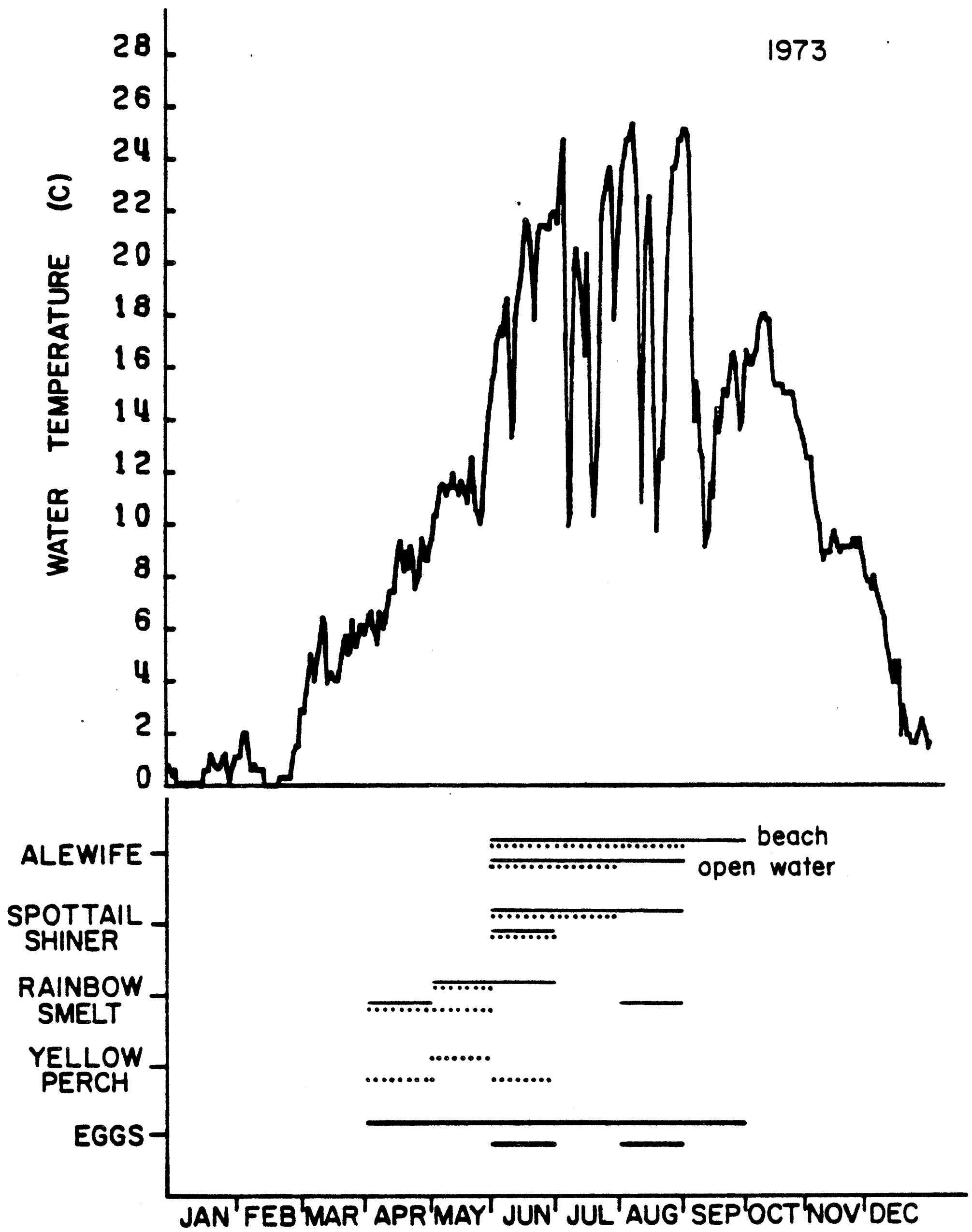


Figure 5. Seasonal occurrence of unidentified fish eggs (———), and yolk-sac larvae (··········) and post-yolk-sac larvae (———) of alewife, spottail shiner, rainbow smelt, and yellow perch in field samples during 1973. Beach samples were taken once per month in April-November, open water samples once per month in April-October. Temperature profile represents daily water temperatures (6-m depth) recorded at St. Joseph, Michigan, approximately 16 km north of the plant.

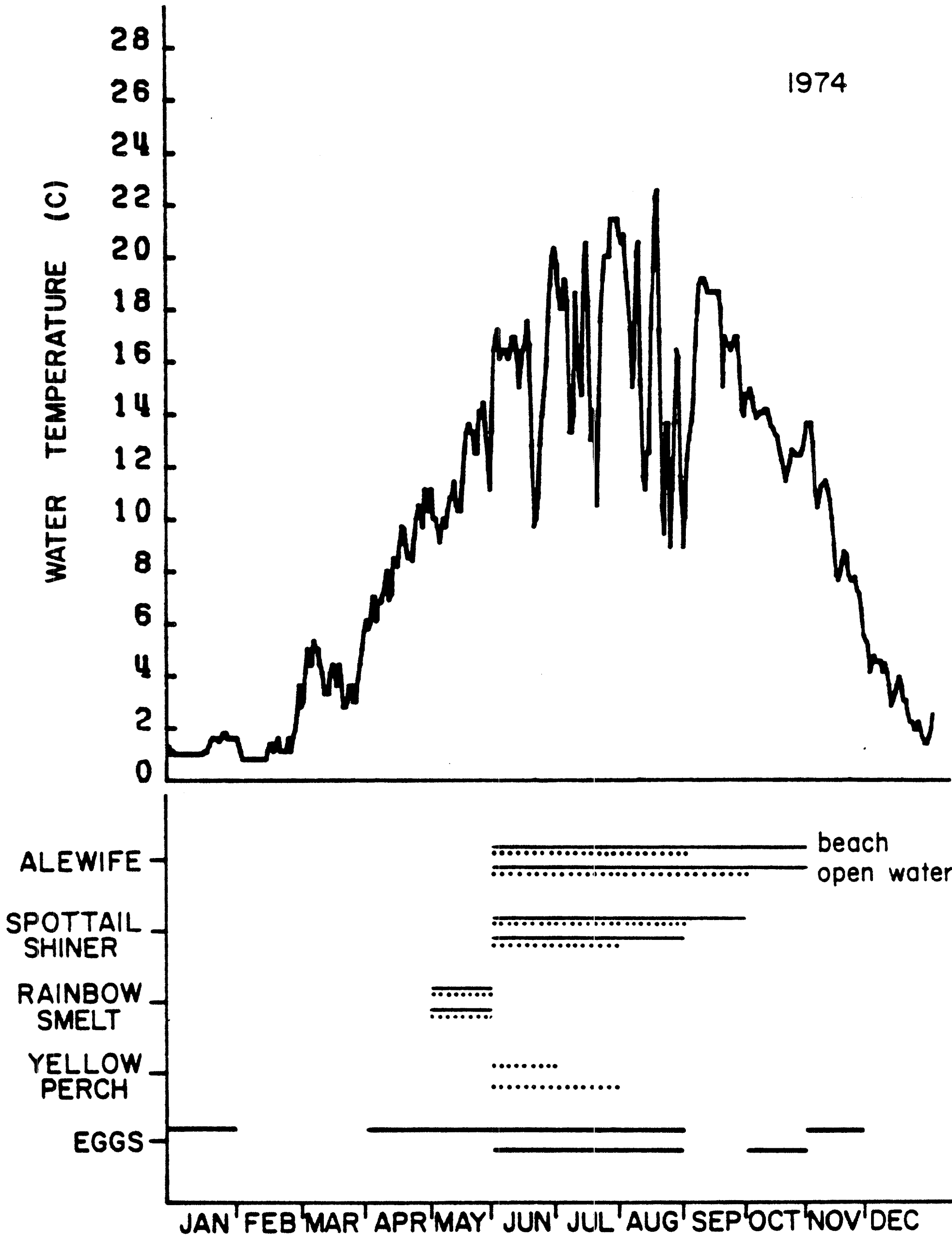


Figure 6. Seasonal occurrence of unidentified fish eggs (———), and yolk-sac larvae (·········) and post-yolk-sac larvae (———) of alewife, spottail shiner, rainbow smelt, and yellow perch in field samples during 1974. Beach samples were taken once per month in January and March-November. Open water samples were taken once per month in April-November. Temperature profile represents daily water temperatures (6-m depth) recorded at St. Joseph, Michigan, approximately 16 km north of the plant.

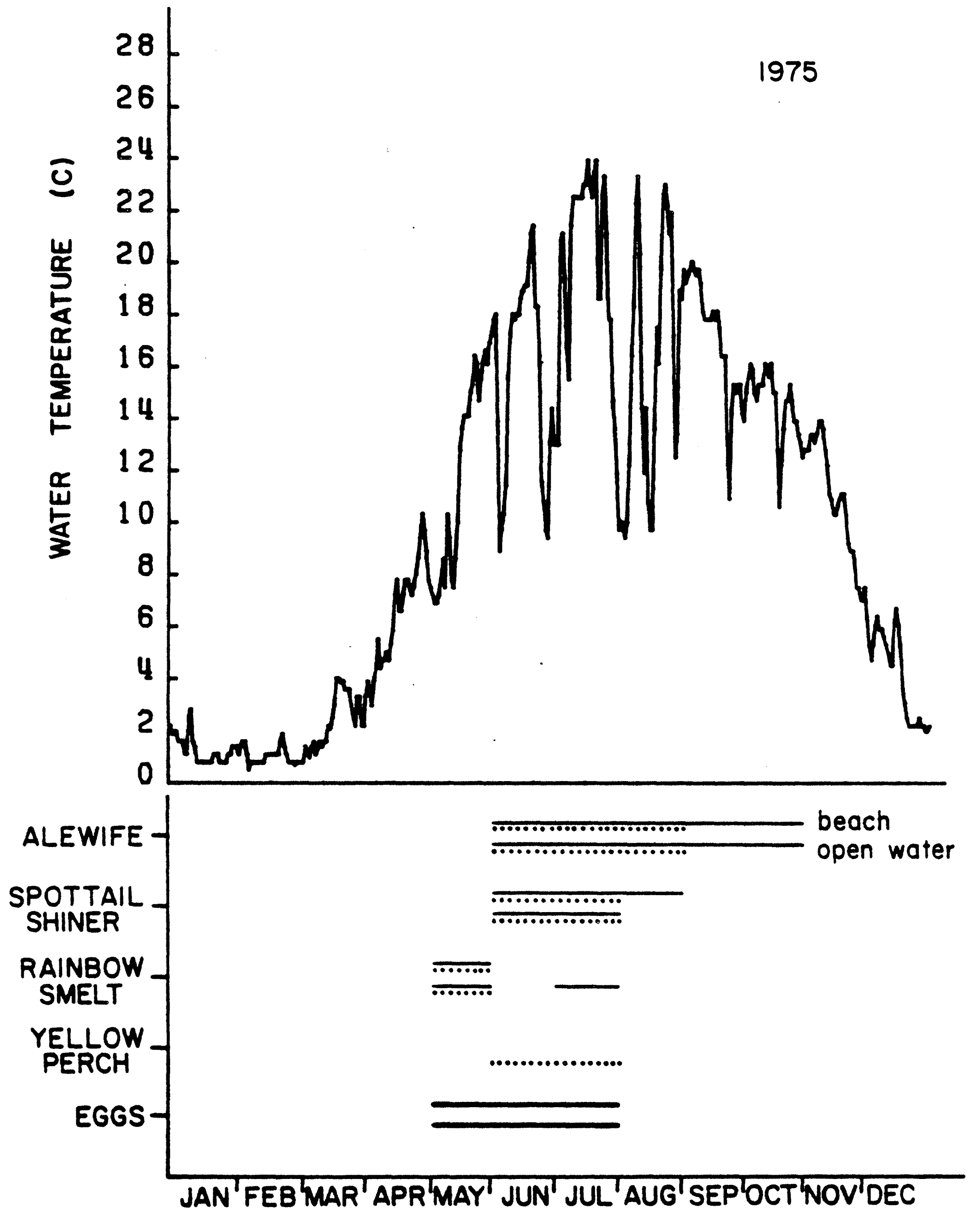


Figure 7. Seasonal occurrence of unidentified fish eggs (———), and yolk-sac larvae (·········) and post-yolk-sac larvae (———) of alewife, spottail shiner, rainbow smelt, and yellow perch in field samples during 1975. Both beach and open water samples were taken once per month in April-November. Temperature profile represents daily water temperatures (6-m depth) recorded at St. Joseph, Michigan, approximately 16 km north of the plant.

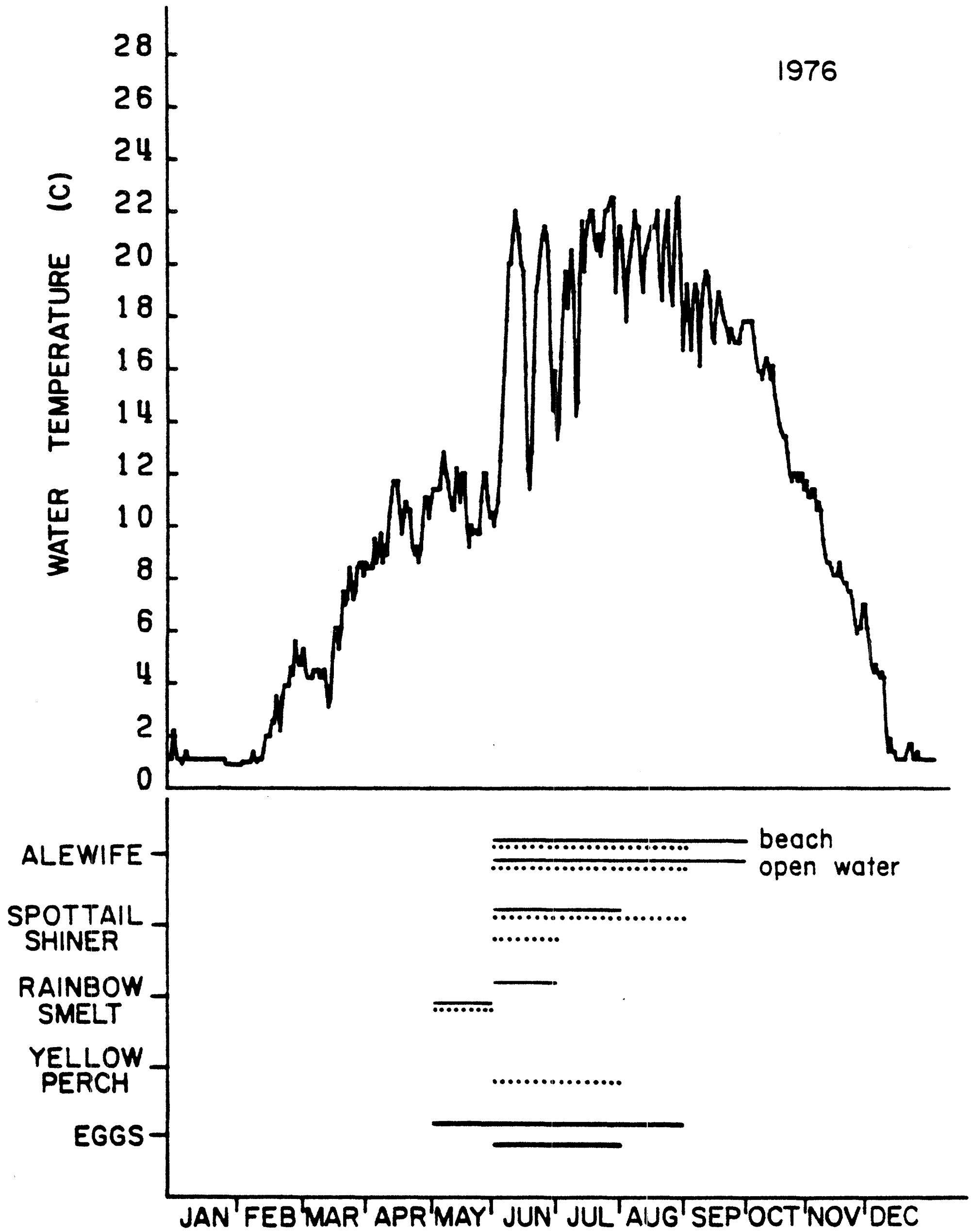


Figure 8. Seasonal occurrence of unidentified fish eggs (———), and yolk-sac larvae (·········) and post-yolk-sac larvae (———) of alewife, spottail shiner, rainbow smelt, and yellow perch in field samples during 1976. Beach samples were taken once per month in February and April-November. Open water samples were taken once per month in April-October. Temperature profile represents daily water temperatures (6-m depth) recorded at St. Joseph, Michigan, approximately 16 km north of the plant.

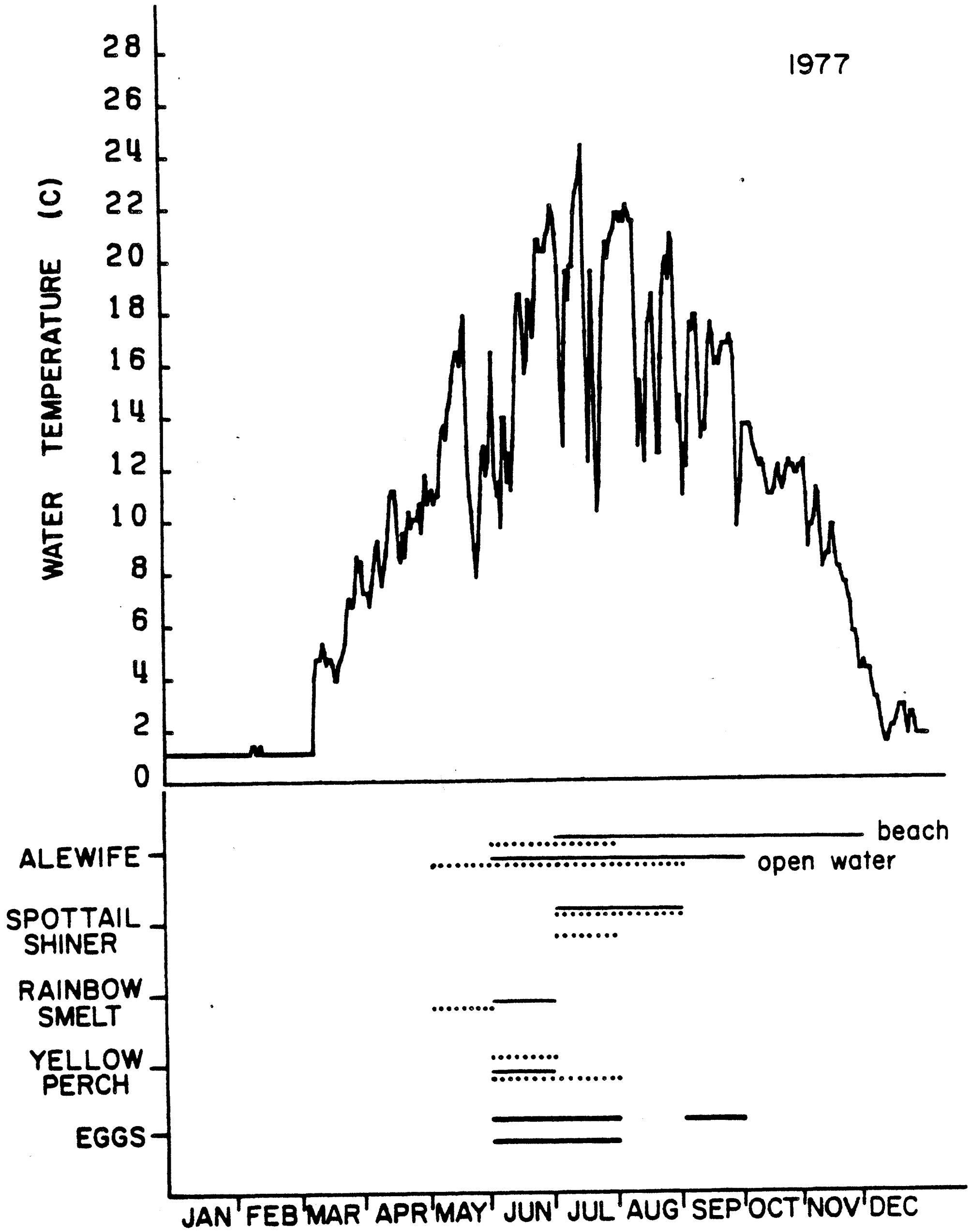


Figure 9. Seasonal occurrence of unidentified fish eggs (———), and yolk-sac larvae (········) and post-yolk-sac larvae (———) of alewife, spottail shiner, rainbow smelt, and yellow perch in field samples during 1977. Beach samples were taken once per month in April-November, open water samples once per month in April-September. Temperature profile represents daily water temperatures (6-m depth) recorded at St. Joseph, Michigan, approximately 16 km north of the plant.

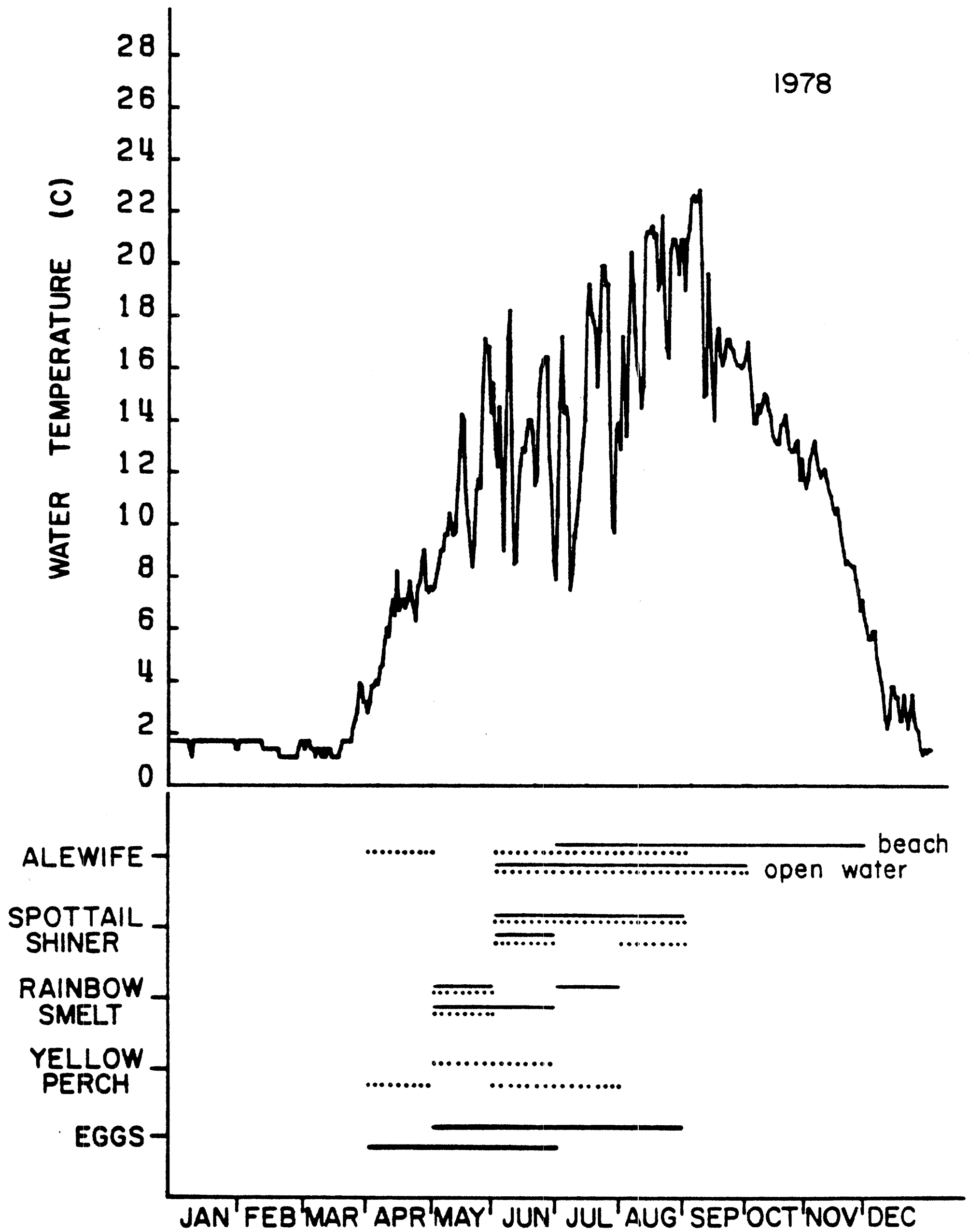


Figure 10. Seasonal occurrence of unidentified fish eggs (———), and yolk-sac larvae (·········) and post-yolk-sac larvae (———) of alewife, spottail shiner, rainbow smelt, and yellow perch in field samples during 1978. Beach samples were taken once per month in April-November, open water samples once per month in April-September. Temperature profile represents daily water temperatures (6-m depth) recorded at St. Joseph, Michigan, approximately 16 km north of the plant.

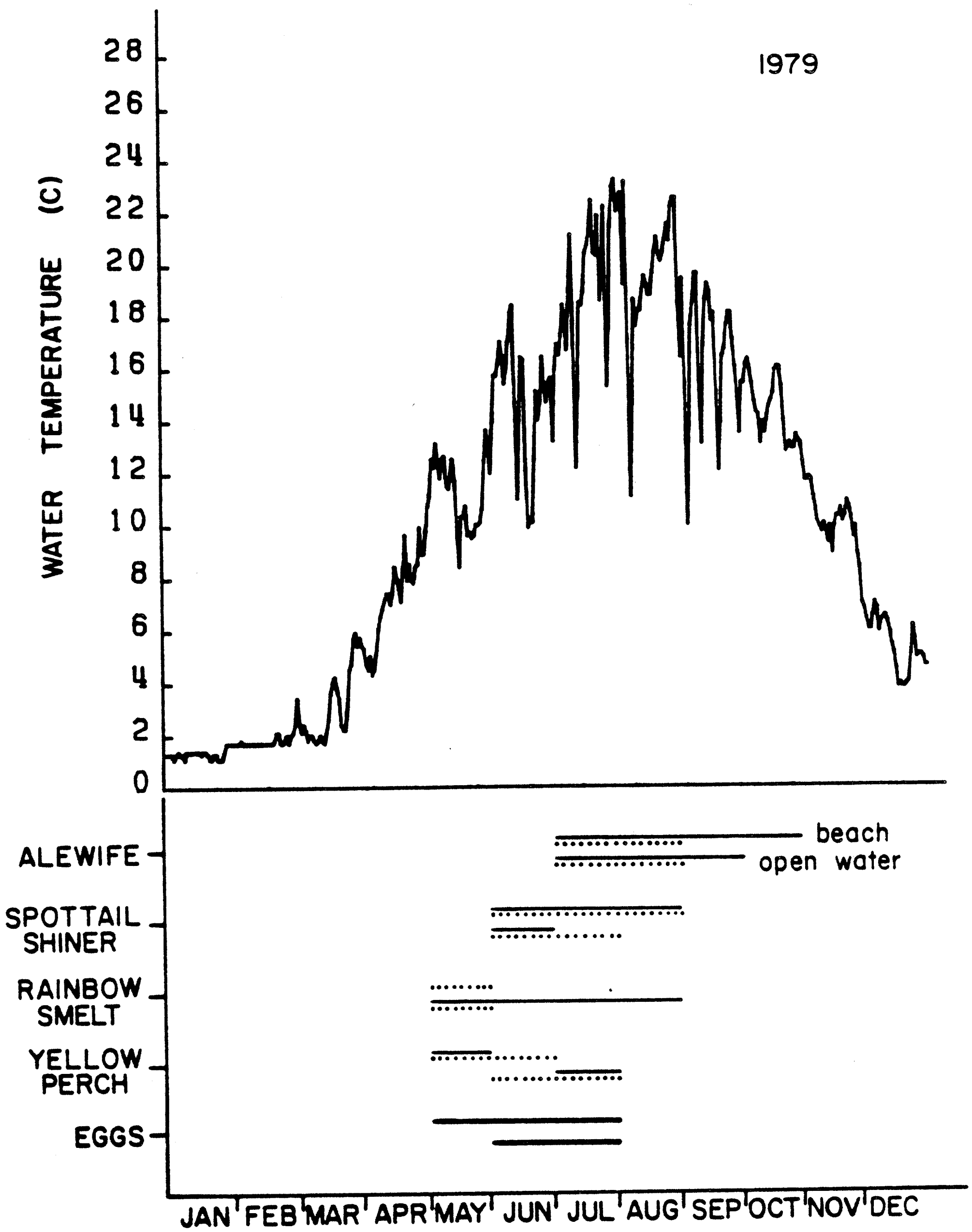


Figure 11. Seasonal occurrence of unidentified fish eggs (——), and yolk-sac larvae (·········) and post-yolk-sac larvae (——) of alewife, spottail shiner, rainbow smelt, and yellow perch in field samples during 1979. Beach samples were taken once per month in April-November, open water samples once per month in April-September. Temperature profile represents daily water temperatures (6-m depth) recorded at St. Joseph, Michigan, approximately 16 km north of the plant.

Table 2. Water temperatures (°C) at larval fish sampling stations (N = 6 for beach, and 36 for open water samples) in each monthly sampling period from May to August, 1973-1979, near the D. C. Cook Plant, southeastern Lake Michigan.

Year	Month	Beach Stations (A, B, F)		Open Water Stations (C, D, G, H)	
		Minimum	Maximum	Minimum	Maximum
1973	May	10.7	12.5	9.3	11.9
	Jun	22.0	24.5	16.3	22.0
	Jul	21.5	25.3	15.5	22.4
	Aug	23.8	26.8	8.5	17.0
1974	May	11.1	12.7	8.4	10.5
	Jun	16.5	18.2	14.2	17.6
	Jul	20.4	24.0	10.2	25.0
	Aug	16.8	24.0	16.4	24.0
1975	May	9.5	12.9	7.8	10.0
	Jun	13.8	16.5	7.9	17.0
	Jul	24.4	27.7	21.6	23.9
	Aug	22.9	24.0	17.7	24.4
1976	May	15.0	17.5	10.5	13.1
	Jun	21.3	24.5	19.2	20.5
	Jul	18.0	22.0	17.3	25.1
	Aug	22.0	24.5	20.6	22.5
1977	May	16.8	18.1	16.0	20.0
	Jun	14.2	15.4	14.5	18.5
	Jul	20.0	23.1	19.6	22.3
	Aug	22.5	24.3	19.4	23.5
1978	May	10.0	11.9	7.5	10.5
	Jun	9.5	16.0	5.3	13.0
	Jul	9.0	15.0	6.0	11.0
	Aug	21.0	25.2	21.8	22.0
1979	May	12.5	15.0	12.2	9.5
	Jun	16.5	18.5	12.0	17.0
	Jul	21.4	25.5	17.0	22.7
	Aug	23.0	26.0	19.0	24.2

evident. First, abundance was least in the lowest depth stratum, and second, distribution changed from day to night (Tables 3 and 4).

Table 3. Vertical distribution of alewife larvae at 6-m stations C (Cook) and G (Warren Dunes), June through August, 1974-1979. Abundance data are total densities (number per 1,000 m^3) summed across all samples and all months each year for each depth stratum. N = 288 samples.

Depth Stratum (m)	Sum of Densities (thousands)		% of Total	
	Night	Day	Night	Day
0	43	18	26	21
2	46	31	27	36
4	45	24	27	28
6	34	14	20	16
Totals	168	87	100	100

During the day, peak densities occurred in the 2-m stratum, and abundance declined with increasing depth. Larvae were relatively scarce in surface samples. At night, larvae concentrated in the 0-, 2-, and 4-m strata. Thus, larvae in day and night samples showed similar depth distributions except that some appeared to migrate to the surface at night.

Diel distribution--

In general, more alewife larvae were caught at night than during the day at both beach and open water stations. Geometric mean densities (number per 1,000 m^3) of larvae at beach stations A, B, and F for the period 1973-1979 were 230 during the day and 390 at night. For open water 6- and 9-m stations C, D, G, and H, the comparable densities were 50 and 110. The day-night differences were statistically significant (ANOVA; beach, $p < 0.001$; open water, $P = 0.01$) at both groups of stations. Thus, daytime densities exceeded nighttime densities at beach stations in 1973 and 1977, and at open water stations in 1977.

Table 4. Vertical distribution of alewife larvae at 9-m open water stations D (Cook) and H (Warren Dunes), June through August, 1974-1979. Abundance data are total densities (number per 1,000 m³) summed across all samples and all months each year for each depth stratum. N = 360 samples.

Depth Stratum (m)	Sum of Densities (thousands)		% of Total	
	Night	Day	Night	Day
0	30	7	22	11
2	34	19	25	30
4	27	17	20	27
6	22	10	16	16
8	21	10	16	16
Totals	134	63	100	100

Densities were greater at night than during the day throughout the season at open water stations. This daily change in abundance occurred consistently from month to month and year to year. Only in June and July 1977 and August 1978 did daytime catches exceed night catches. In the latter two cases, the reversal probably occurred because night samples were taken more than 2 wk later than day samples on dates outside the period of peak alewife abundance. The most important source of the diel shift in abundance was that larvae probably avoided nets more effectively in daylight. Net avoidance increases as larvae grow and develop their swimming ability and vision (Houde 1969, Theilacker and Dorsey 1980). Thus, evidence for net avoidance was that samples usually contained more large larvae at night than in daytime (Fig. 12). The proportion of larvae captured at night (number captured at night divided by the sum of the number captured at night and the number captured in daytime) increased with body size. At open water stations proportion of larvae captured at night rose from 60 to 73% for larvae < 13 mm and to 95% for larvae > 17 mm (Table 5). This result indicates that nighttime catches estimated larval abundance more reliably than daytime catches, especially for larger larvae.

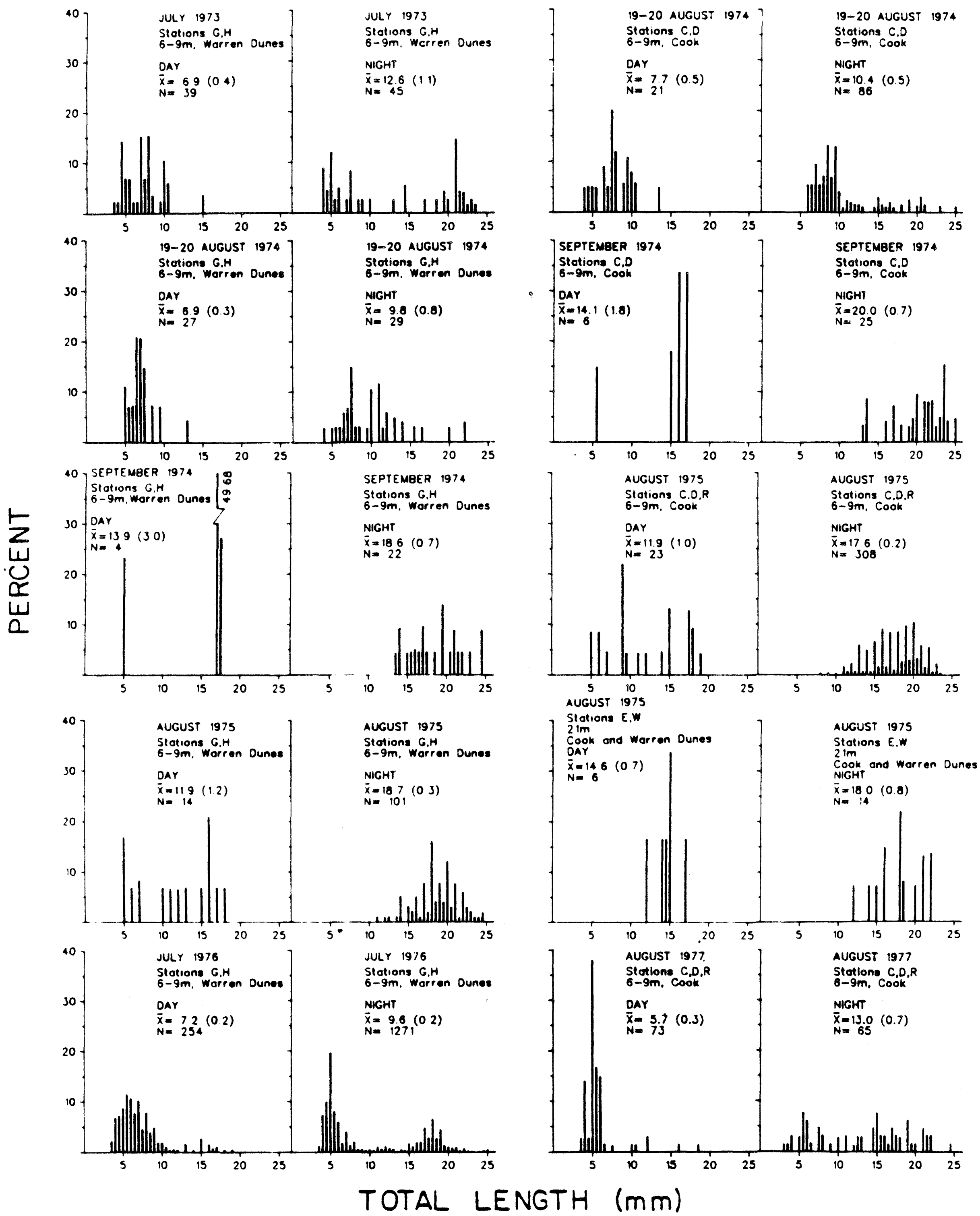


Figure 12. Diel differences in length-frequency distributions of alewife larvae in open water samples at the D. C. Cook Plant, 1973-1979. N = number of larvae, $\bar{X}$ = mean length, standard error is given in parentheses.

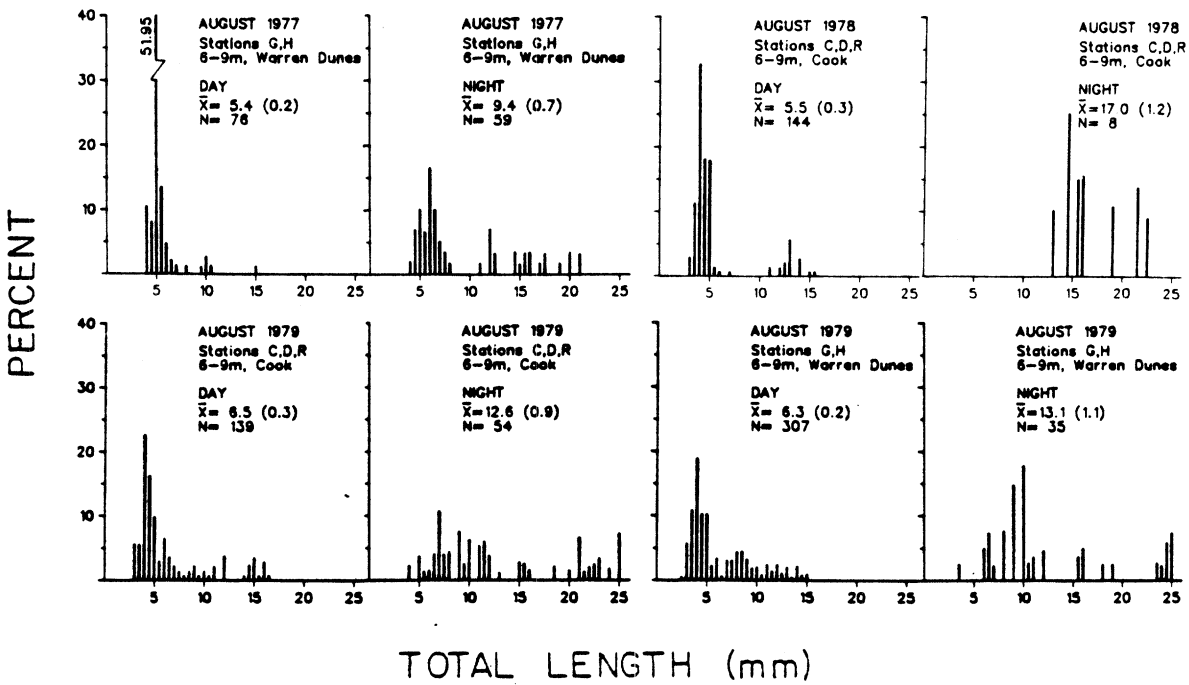


Figure 12. Continued.

The diel pattern at beach stations was less consistent. Alewife larvae were significantly more common at night in June and July but more common during the day in August (ANOVA, $P < 0.001$). Only in 1979 were larvae more abundant at night in June, July, and August. We attributed the seasonal diel shift to a daily migration between the beach and open water zones by larger larvae, because more larger larvae were collected in the beach zone during the day (the time of greater net avoidance) than at night. The proportion of larvae > 7.1 mm collected during the day in the beach zone usually comprised over 80% of the day-night catch (Table 5), while more smaller larvae (< 7 mm) were collected at night (58-65% of the total catch). By August, large larvae usually dominated collections, hence the greater abundance of larvae in daytime in August.

Whenever larvae > 7 mm were present at beach stations, they were more abundant in daytime than in nighttime samples (Fig. 13). However, the largest larvae (> 20 mm) were often more abundant at night (Fig. 13, last six graphs), perhaps because they were virtually uncatchable in daylight.

Table 5. Night-to-day catch ratios (% caught at night) for different sizes of larval alewives in field samples, 1974-1978. Percentages are based on total density, which is number per 1,000 m^3, summed across all samples and all years at 6- and 9-m open water stations C, D, G, and H and beach stations A, B, and F.

Length Interval (mm)	Habitat	
	Open water	Beach
3.1- 5.0	73	58
5.1- 7.0	60	65
7.1- 9.0	65	19
9.1-11.0	71	15
11.1-13.0	73	11
13.1-15.0	79	12
15.1-17.0	90	35
17.1-19.0	96	28
19.1-21.0	100	22
21.1-23.0	98	15
23.1-25.0	98	30

A direct demonstration of the hypothesis of horizontal migration would require detection of an influx of large larvae to the open water zone at night, but such an effect would be masked by the observed nocturnal increase in the catch of large larvae stemming from their increased vulnerability to nets at night. The data provide indirect evidence of horizontal migration in August; namely, nighttime beach densities dropped relative to open water densities in August. Mean densities at beach stations exceeded those at open water stations in 62% of the daytime sampling periods in June and July and in 57% of the periods in August. There was little difference between daytime beach densities and open water densities in August when compared with

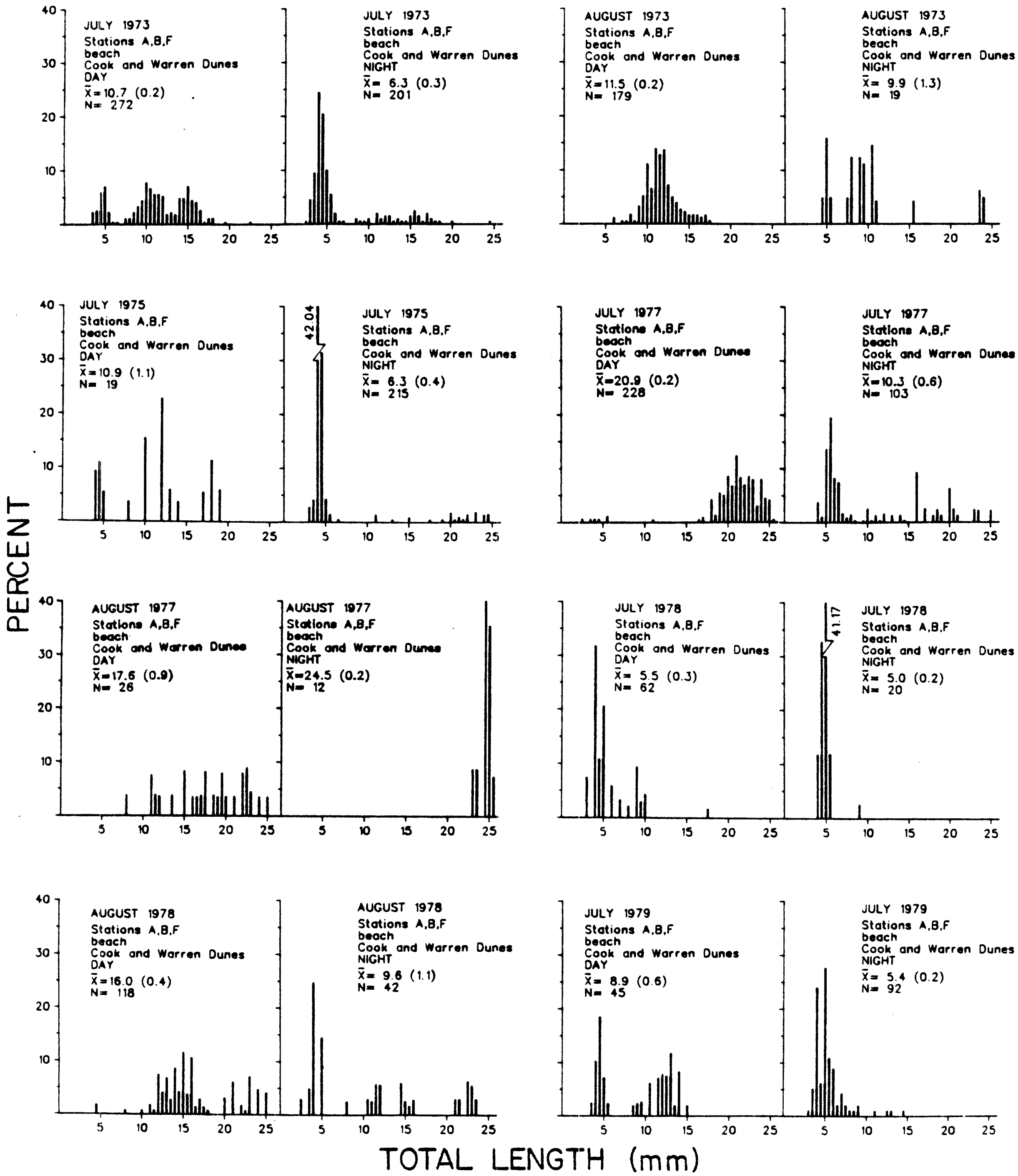


Figure 13. Diel differences in length-frequency distributions of alewife larvae in beach zone samples at the D. C. Cook Plant, 1973-1979. N = number of larvae, $\bar{X}$ = mean length, standard error is given in parentheses.

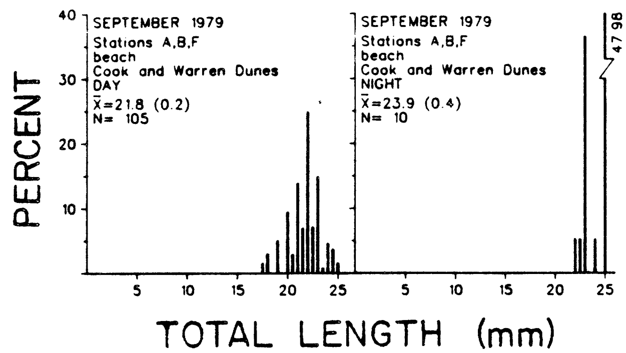


Figure 13. Continued.

June and July. In contrast, beach densities exceeded open water densities in 77% of the nighttime sampling periods in June and July but in only 43% of them in August.

Depth distribution--

In general, larval alewife abundance at sampling stations declined with increasing bottom depth. Geometric mean densities (number per 1,000 m^3), averaged for the period 1973-1979, were 296 at beach stations, 104 at 6-m stations, and 52 at 9-m stations, and these mean densities differed significantly (ANOVA, $P < 0.01$). Abundance was even lower at 21-m stations. From June through August, 1975-1979, the number of nighttime samples containing alewife larvae at 9-m stations D and H was 95 versus 54 at 21-m stations E and W.

On a yearly basis, fish larvae abundance correlated more consistently with bottom depth than with any other parameter. Mean densities at beach stations exceeded those at 6-m stations in all years except 1974, the year of maximum abundance at open water stations, and 1979, when the open water value was only 10% higher. Densities at beach and 6-m stations exceeded those at 9-m stations in all years and in all months. Alewife larvae were scarce at 21-m stations compared to high abundances inshore chiefly because newly hatched fish (< 5 mm) were much scarcer at 21 m than at 6 or 9 m (Fig. 14). The relative lack of hatchlings at 21 m presumably occurred because spawning and hatching were concentrated inshore. On the single occasion that larvae were more abundant at 21 m (night samples, August 1977), length distributions differed greatly among station groups (Fig. 14, last three graphs). The difference in lengths implies that samples were from different populations and thus from separate

water masses. In fact, subsurface temperatures at 21-m stations E and W rose from 8°C on 9 August (during daytime sampling) to 22°C on 10 August (during night sampling); that is, a warm water mass replaced a cold one, presumably bringing with it a different larval fish population.

Water temperature was an important correlate of larval fish abundance in the study area, month by month (Table 2, Figs. 5-11). Larval alewife densities at beach stations were as great as or greater than at open water stations in June of every year, and temperatures were higher at the beach than in open water during the June field trip in every year except 1977 (Table 2). July water temperatures were highest in the beach zone in 5 yr; temperatures were higher in the open water zone in 1974 and 1976. The warmer zone in July had the greater mean larval fish density in all years except 1975. August water temperatures were similar at all depth contours in all years except 1973, and no depth-related trends in abundance from year to year could be discerned from August data; in 4 yr the beach zone and in 3 yr the open water zone contained higher densities of larvae.

Growth and survival --

Seasonal changes in length-frequency distribution of larval alewives helped show pulses of spawning and tracked the growth of cohorts. Length-frequency histograms in all years showed three consistent seasonal changes for alewives (Fig. 15). First, mean size of larvae increased through the season because larvae grew. Second, the abundance peak at the lower end of the distribution became less pronounced by August, as spawning declined and newly hatched larvae became scarce. Third, the greatest range of sizes occurred in midsummer, when both newly hatched and older larvae were present.

Length histograms for open-water stations were like those shown for beach stations but with fewer large larvae (see Alewife--diel distribution). Consequently, data on size distributions in the open water zone in late summer and fall were sketchy.

Deviations from the normal seasonal progression of spawning and growth occurred in 1978 and 1979 (Fig. 16), when intermittent low temperatures (upwellings) occurred in the open-water zone during the spawning season. In 1978 the usual large July hatch failed to occur and spawning was delayed into August. Temperatures in early July were 10-14°C (Table 6), the coldest recorded for that month during 1973-1979. In 1979 no substantial alewife hatching had occurred by the 11-13 June sampling period, either at the beach or offshore. Alewife larvae were first collected in July, and hatchlings were still abundant in August.

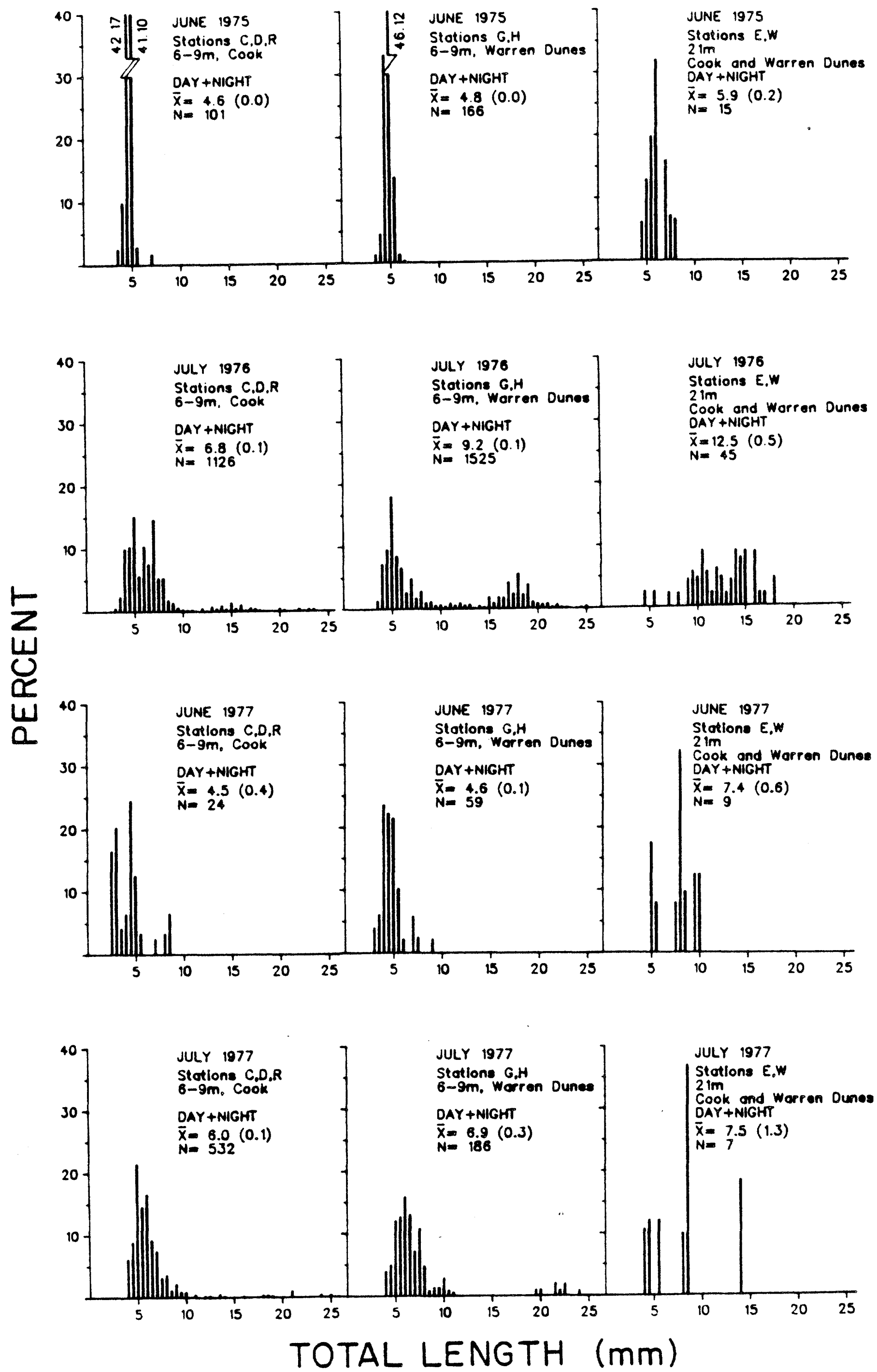


Figure 14. Length-frequency distributions of alewife larvae at 6-, 9-, and 21-m stations at the D. C. Cook Plant, 1975-1979. N = number of larvae, $\bar{X}$ = mean length, standard error is given in parentheses.

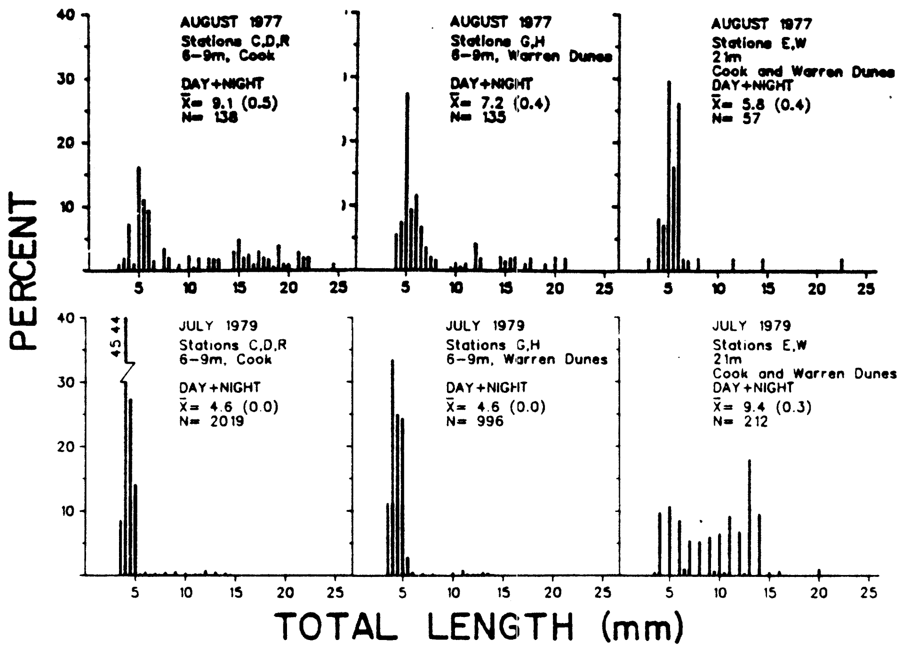


Figure 14. Continued.

Early June temperatures were about 12°C (Table 6), the coldest recorded for that month during 1973-1979. The effects of cold-water upwelling on alewife spawning in eastern Lake Michigan, viz., interruption of spawning and extension of the spawning season, are discussed in detail by Heufelder et al. (1982).

Declining abundance with increasing body length allowed estimates of length-specific survival rates, which measured with size the change in the likelihood that a larva would reach maturity. This is useful because the survival rate of larvae determines the number of fish recruited to adult stocks.

Changes in the abundance of larvae as they grew were estimated by plotting a catch curve, that is, the number of larvae caught in each 0.5-mm interval of total length. To estimate the number of larvae, the method of Cada and Hergenrader (1980) was followed and densities were summed for the years 1974-1979, one sum each for beach and open water data. Only nighttime catches were used because they were less biased by net avoidance and diel migration than daytime catches.

A plot of the logarithm of total density in each length interval produced complex catch curves (Fig. 17). Despite the presence of confounding factors, we can draw several conclusions

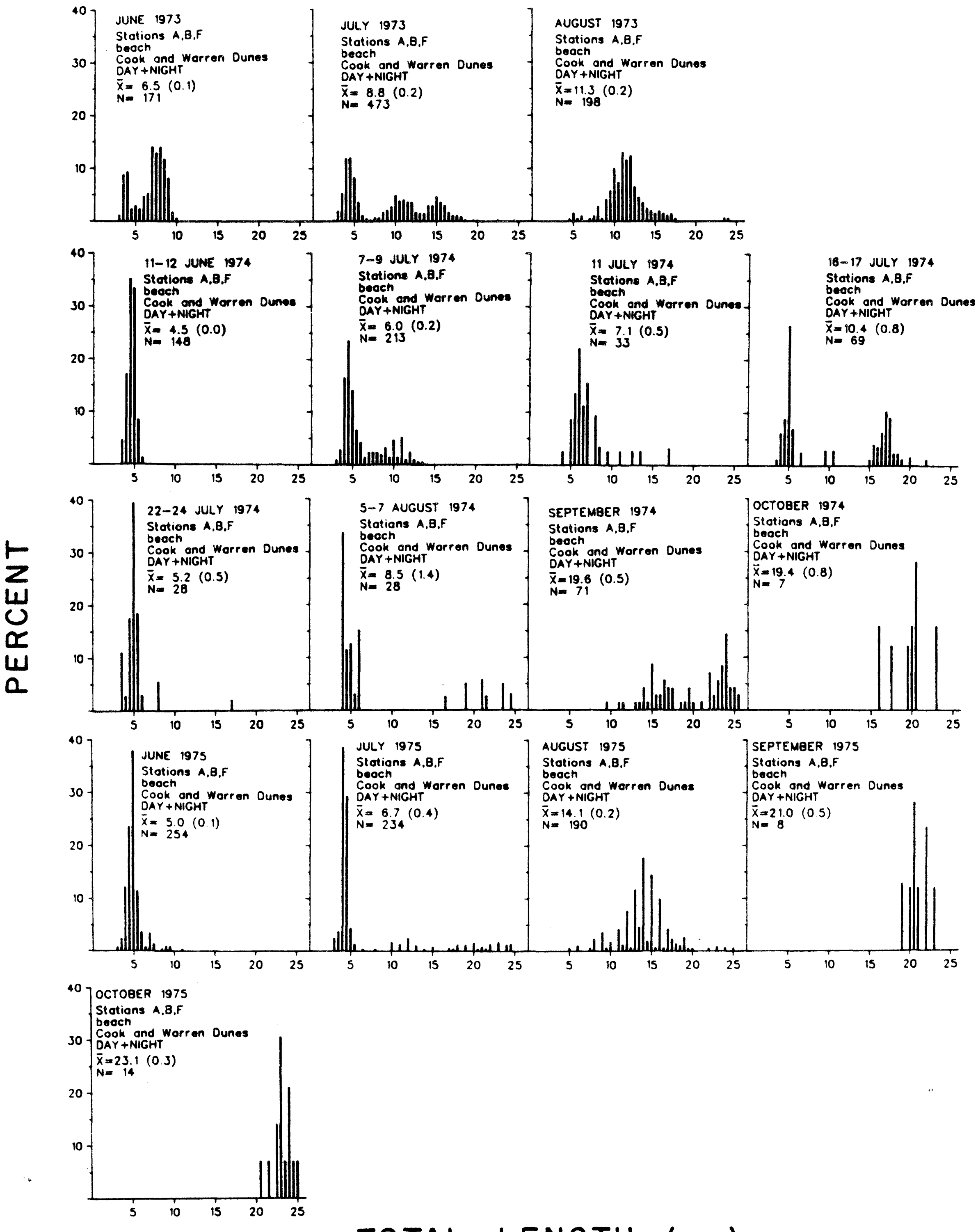
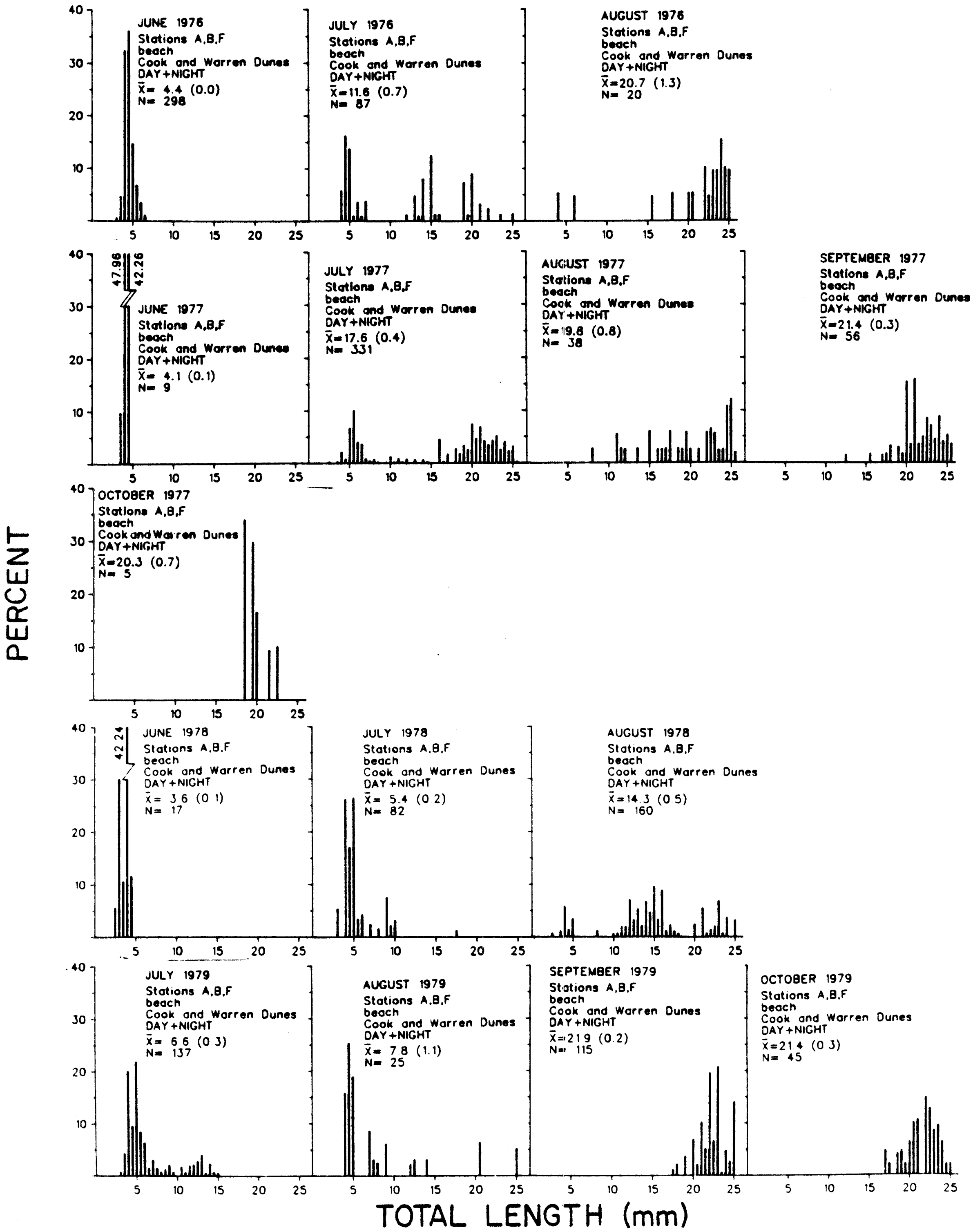


Figure 15. Length frequencies of alewife larvae at beach stations at the D. C. Cook Plant, 1973-1979. N = number of larvae, $\bar{X}$ = mean length, standard error is given in parentheses.



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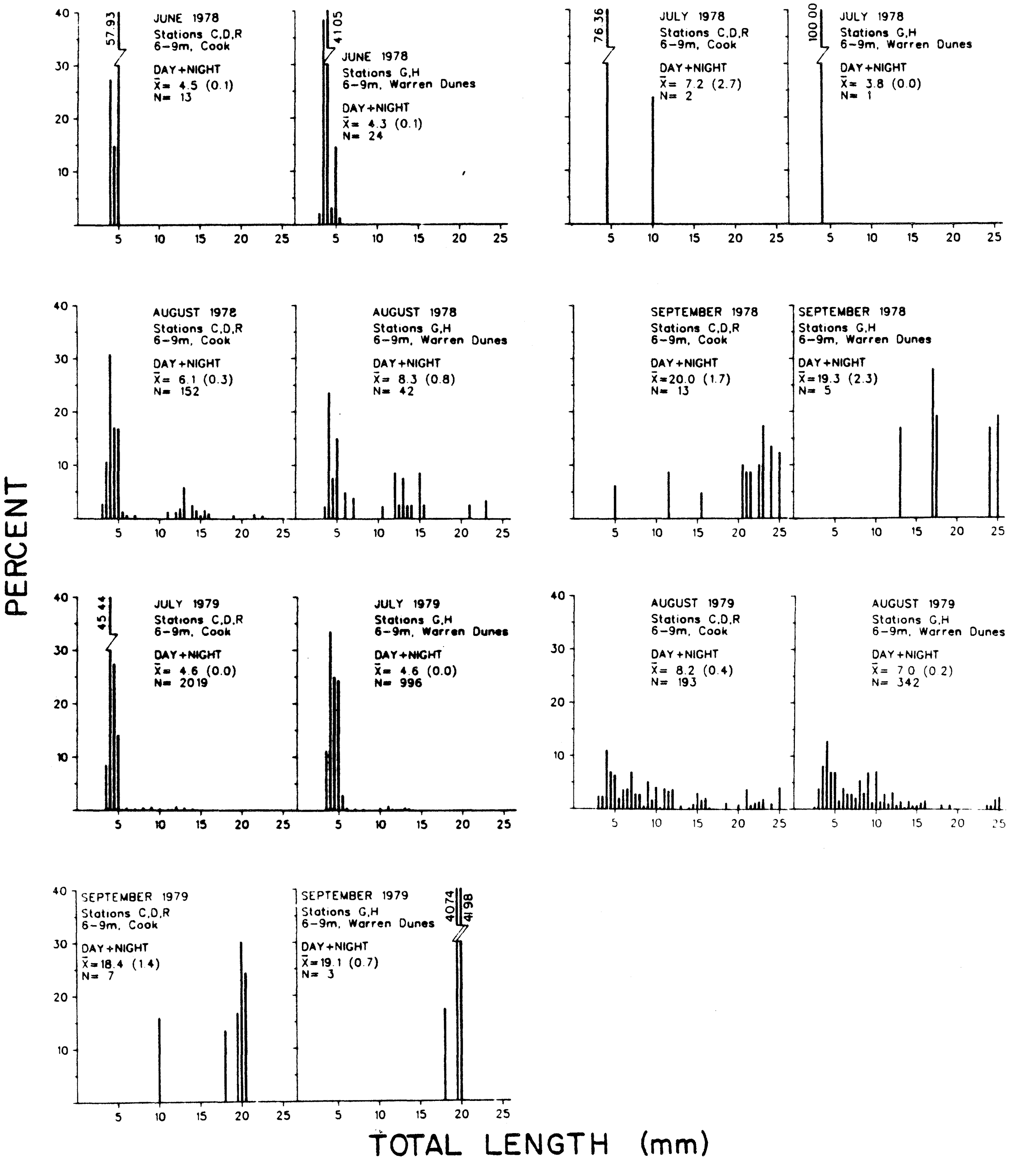

Figure 16. Length frequencies of alewife larvae at open water stations C, D, R (Cook Plant), and G, H (Warren Dunes) in 1978 and 1979. N = number of larvae, $\bar{X}$ = mean length, standard error given in parentheses.

Table 6. Water temperature 1 wk before June and July open water larval fish sampling dates, 1973-1979. Data are from the St. Joseph municipal water intake, 16 km north of the Cook Plant, at the 6-m bottom depth.

Year	Water Temperature (°C)	
	Early June	Early July
1973	16	14-20
1974	14	14-16
1975	16	14
1976	18	16
1977	12-14	20-22
1978	8-18	10-14
1979	12	15

from the curves. First, the smallest fish were the most common. The first interval, 3-5 mm, encompasses the prolarval stage, during which larvae gradually absorb their yolk sac. The next interval (5-7 mm) marks the start of the postlarval stage, in which the yolk sac is absent. The catch curves show that about 29% of the prolarvae in the beach zone and 22% of the prolarvae in the open water zone survived to become postlarvae. Rago (1983) reported similar results using 8 yr of entrainment data from the Cook Plant in a model based on an overall first year survival rate of 1%. He estimated 29% (average over 8 yr, SE = 6.6) survival from prolarva to postlarva and 10% (average over 8 yr, SE = 3.1) survival from postlarva to young-of-the-year (YOY). Our field data suggest a 4-5% survival rate from postlarva to YOY (last interval on the catch curves, Fig. 17).

Spottail Shiner

Occurrence of larval spottail shiners in the study area was sharply seasonal, like that of alewife, and corresponded with the period of maximum water temperatures (Figs. 5-11). Spottail shiner larvae first appeared in field samples at both beach and open water stations in June, although not until July in 1977. At

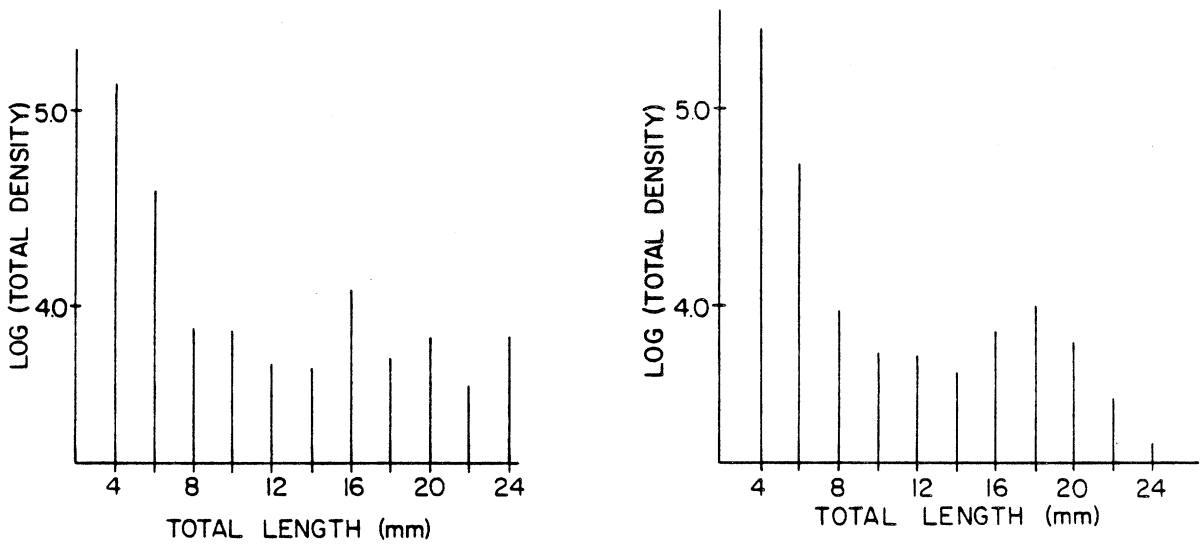

Figure 17. Length-frequency distributions of alewife larvae in nighttime field samples, 1974-1979 combined. Total density is no./1,000 m^3, summed across all samples and all years. Total length shown is midpoint of a 2-mm interval. Left panel: beach zone, stations A (north Cook), B (south Cook), and F (Warren Dunes). Right panel: open water zone, stations C (6 m, south Cook), D (9 m, south Cook), G (6 m, Warren Dunes), and H (9 m, Warren Dunes).

beach stations June samples had the greatest number of larvae in 1973, 1975, 1976, and 1978, while July was the peak month in 1974, 1977, and 1979. The last occurrences of larvae at beach stations were in August, with the exception of September 1974. The months of peak density at open water stations were the same each year as those at the beach, except that July was the peak month in 1975.

Densities of spottail shiner larvae in Cook Plant study areas differed significantly among years (ANOVA, $P < 0.001$). Geometric mean densities (number per 1,000 m^3) at beach stations for 1973-1979 were 41, 1,142, 518, 177, 41, 36, and 487, respectively. These results suggest either a highly variable reproductive output in this species or that our once-a-month sampling program sometimes caught and sometimes missed the period of peak abundance. At open water stations, relative abundance was estimated by the number of samples in which spottail shiner larvae occurred. Larvae were found in 20 samples in 1975, 13 in

1979, 12 in 1974, and in 4 or fewer in other years. Hence, yearly abundance trends were parallel at beach and open water stations, except for 1974.

Spottail shiner larvae were much more abundant in the beach zone than offshore. Most samples from open water contained no larvae, and this result precluded comparisons of mean densities at beach and open water stations; however, a steep decrease in abundance with depth was evident. Abundance trends offshore were estimated by comparing the number of samples containing larvae at different depth contours in the period 1973-1979 (1975-1979 at 21-m stations E and W). Stations C and G (6 m) produced 25 such samples; stations D and H (9 m), 15; and stations E and W (21 m), 1. Catch of spottail shiner larvae in bottom sled tows in the beach zone in 1974 suggested that larvae were more common on the bottom than in the water column (Jude et al. 1979a), as occurred at the J. H. Campbell Plant, north of the Cook Plant near Grand Haven (Jude et al. 1980a).

Considerably more spottail shiner larvae were caught at night than during the day at beach stations; most daytime samples produced no larvae at all. The same pattern was evident at open water stations C, D, G, H, and R, where 89% of the 55 samples containing spottail shiner larvae in 1973-1979 were taken at night. The day-night difference was attributed to net avoidance and drift of larvae from the nearshore nursery area to offshore waters. Evidence for net avoidance was similar to that given for alewife. First, night samples often contained large larvae, while day samples rarely did. Second, larvae tows were conducted over a wide vertical and horizontal range, omitting only areas far offshore (beyond the 21-m contour), and we felt that migration to such areas did not occur.

In most years spottail shiners were abundant enough in beach zone samples to show seasonal changes in size distribution, and the changes outlined the schedule of hatching and growth (Fig. 18). Hatchlings (4-5 mm) usually appeared in June and persisted into the first week of August (Figs. 5-11). Spawning began late in 1977, with larvae first collected in July and 4-mm newly hatched larvae still present in August. Water in the beach zone was 14-15°C during the June sampling period, which represents the lower end of the spawning-temperature range reported for spottail shiners (Auer 1982). Net avoidance probably was the reason spottail shiner larvae were absent from our samples in September and October, when no small larvae were present.

Densities of spottail larvae in nighttime beach zone samples did not differ significantly between Warren Dunes and Cook Plant stations in the period 1973-1979 (ANOVA, P = 0.79), nor were any differences apparent between preoperational and operational years

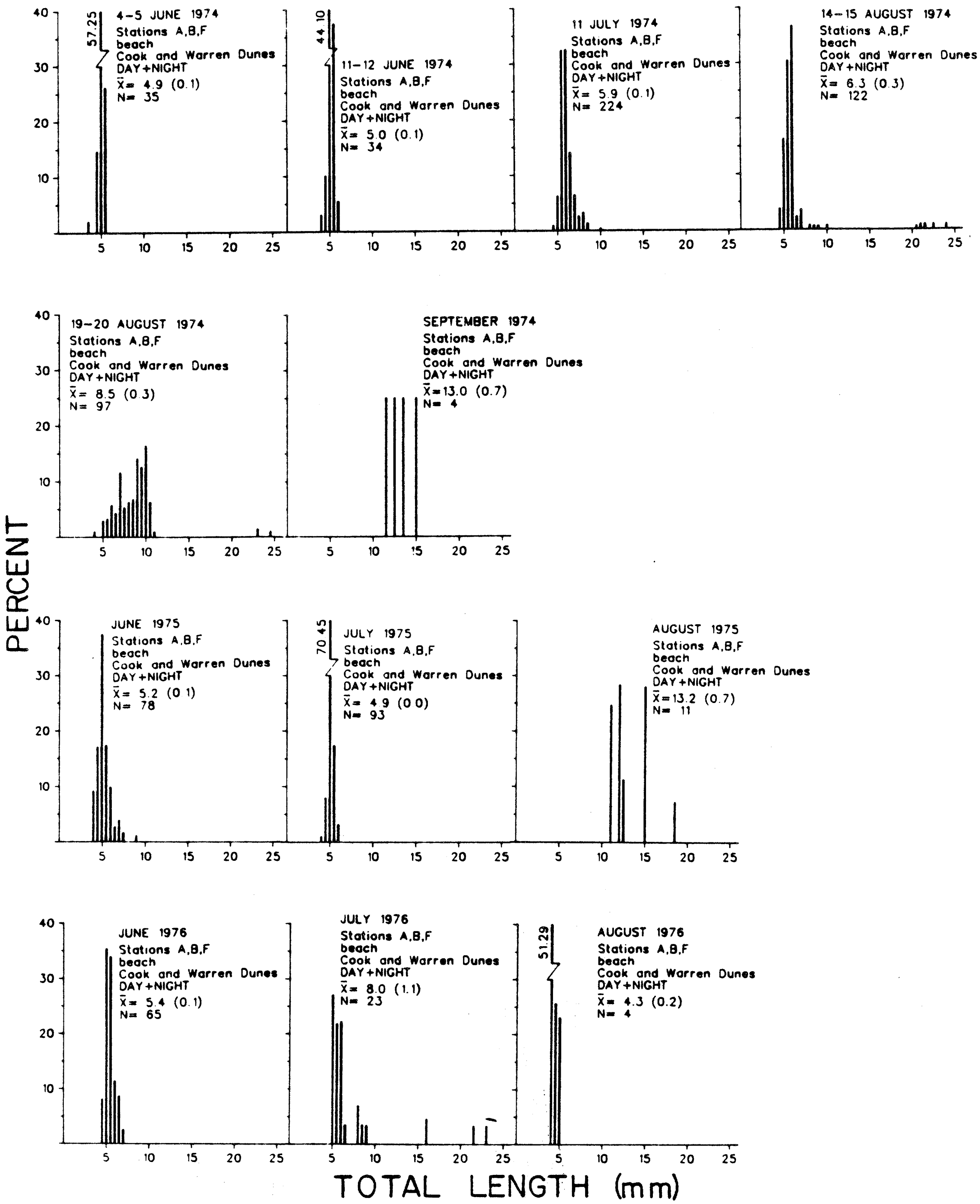

Figure 18. Seasonal growth of spottail shiner larvae at beach zone stations at the D. C. Cook Plant, 1974-1979. N = number of larvae, X̄ = mean length, standard error given in parentheses.

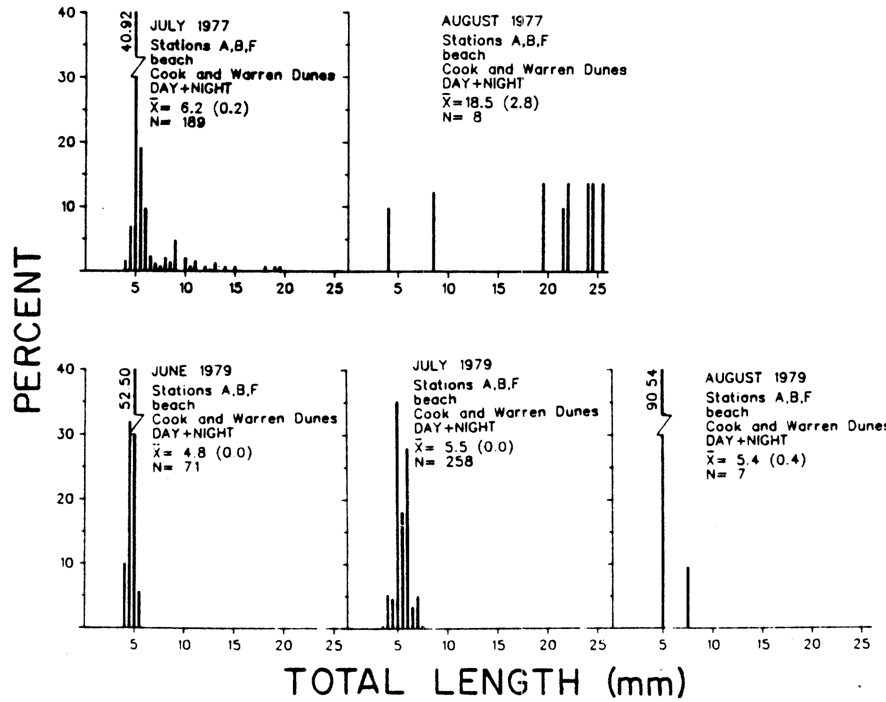

Figure 18. Continued

at Warren Dunes compared with Cook Plant stations. Therefore, we inferred no plant impact on the abundance of spottail shiner larvae.

Yellow Perch

The period of occurrence of larval yellow perch was usually shorter and began earlier than those of alewife and spottail shiner. Yellow perch larvae first appeared in field samples in April in 1973 and 1978 (both years at open water locations), May in 1979, and June in 1974-1977 (Figs. 5-11). Because adult yellow perch in the study area ordinarily did not attain spawning condition until May, the early larvae probably entered Lake Michigan from inland lakes or rivers, where spawning begins sooner than in Lake Michigan (see Perrone et al. 1983). The month of peak abundance of perch larvae was usually June, though scarcity of larvae in 1975 and 1976 makes such a determination uncertain in those years. The latest field samples to contain yellow perch larvae were collected in July, except June in 1973.

Because low numbers of larval yellow perch were caught at most times and stations, the understanding of their distribution in the study area is incomplete. In 1973, 1974, 1977, 1978, and 1979 larval yellow perch were taken in sufficient numbers to permit ANOVA computations, but only in June at open water stations.

Densities of yellow perch larvae in the study area differed significantly among years (ANOVA, $P < 0.01$). Geometric mean densities (number per 1,000 m^3) in June 1973, 1974, 1977, 1978, and 1979 were 3, 17, 16, 4, and 2, respectively. Larvae were too rare in other years for reliable computation of abundance. Larval yellow perch abundance in preoperational and operational years followed no pattern attributable to plant operation. They were scarce at both Warren Dunes and Cook stations in preoperational year 1973 and operational years 1975, 1976, 1978, and 1979. They were most abundant at both sets of stations in preoperational year 1974 and operational year 1977. Abundance did not differ significantly between Warren Dunes and Cook Plant stations (ANOVA, $P = 0.50$). Thus, no plant impact was inferred on the abundance of yellow perch larvae.

Yellow perch larvae were more common at open water than at beach stations. For example, 32, or 10% of open water samples contained yellow perch larvae in the peak year of 1977, while only 1, or 1% of beach-zone samples contained them. Abundances did not differ significantly between the 6- and 9-m contours at open water stations (ANOVA, $P = 0.51$). Through the years 1973-1979, samples contained yellow perch larvae 40 times at stations C and G (6 m) and 46 times at stations D and H (9 m) in the 0.5- through 6-m depth strata. However, abundance declined at greater depths; stations E and W (21 m) yielded yellow perch larvae only 13 times in the period 1975-1979. At 6- and 9-m stations, abundances were similar at all depth strata except the deepest, where yellow perch larvae were least frequently taken.

Yellow perch larvae appeared in 58 daytime and 71 nighttime samples at open water stations C, D, G, H, and R during the period 1973-1979. The difference was not significant (chi-square = 0.66, $P > 0.25$). Conversely, in the beach zone larval yellow perch were captured significantly more often at night than in daytime (chi-square = 4.45, $P < 0.05$). Most of the day-night difference was attributed to net avoidance. Increased rates of net avoidance by larger larvae probably contributed to the nearly complete absence of larvae larger than 10 mm TL from field samples, as well as the absence of larvae from samples after July (Fig. 19). Only 5% of the yellow perch larvae caught were > 7.5 mm TL; it is possible that the survival rate to 8 mm is about 5% (Clady and Hutchinson 1975). Thus, net avoidance was not the sole cause of the rarity of larger larvae. We believe that juvenile and adult alewife, which are common at this time in

inshore waters, preyed on a substantial number of newly-hatched yellow perch. Yellow perch larvae are passive at this stage (Houde 1969) and could easily be preyed upon by alewives.

Rainbow Smelt

Rainbow smelt larvae occurred in field samples over a short season, with first appearance in spring and persistence through part of the summer. At both beach and open water stations, rainbow smelt larvae were first taken in May, except for June 1976 in the beach zone and April 1973 in open water (Figs. 5-11). Unlike the three other abundant species, rainbow smelt larvae typically were most abundant the month they appeared. At beach stations, rainbow smelt rarely occurred in samples after the first month of capture; exceptions were 1973 (one June sample) and 1978 (one July sample). At open water stations, rainbow smelt larvae usually were most abundant the month they first appeared, and their numbers declined each month thereafter. The spawning period for rainbow smelt is generally no more than 3 wk long with the peak rarely lasting more than a wk (Scott and Crossman 1973). The pattern of abundance of larval smelt in this study is therefore not unexpected. Rainbow smelt persisted into June in 1977 and 1978, July in 1975, and August in 1973 and 1979.

Rainbow smelt larvae were too rare to allow comparison of mean densities with ANOVA statistics. Instead the unit of analysis was the number of samples in which they occurred. Larval rainbow smelt were taken in significantly more tows at night than in daylight in 1973-1979 (chi-square = 26.27, $P < 0.01$). Whether the difference was due to daytime net avoidance or to greater nocturnal activity is unknown, but results of bottom sled tows in 1974 suggested that many rainbow smelt were on the bottom during the day and moved up into the water column at night (Jude et al. 1979b).

The depth distribution of larval rainbow smelt changed with the season. Of the 44 beach zone samples containing smelt larvae in 1973-1979, all but 2 were taken in the first month of occurrence of smelt in the beach zone. In contrast, 28% of the 97 open water samples with rainbow smelt were taken later than the month smelt first appeared. Rainbow smelt larvae generally persisted in open water samples longer than in beach samples (Figs. 5-11). These facts suggest that rainbow smelt spawned in the beach zone and larvae moved to open water soon after hatching. The suggestion was supported by length-frequency data (Fig. 20). In years with enough fish to draw conclusions (1974, 1975, 1979), larvae taken in May averaged slightly smaller at

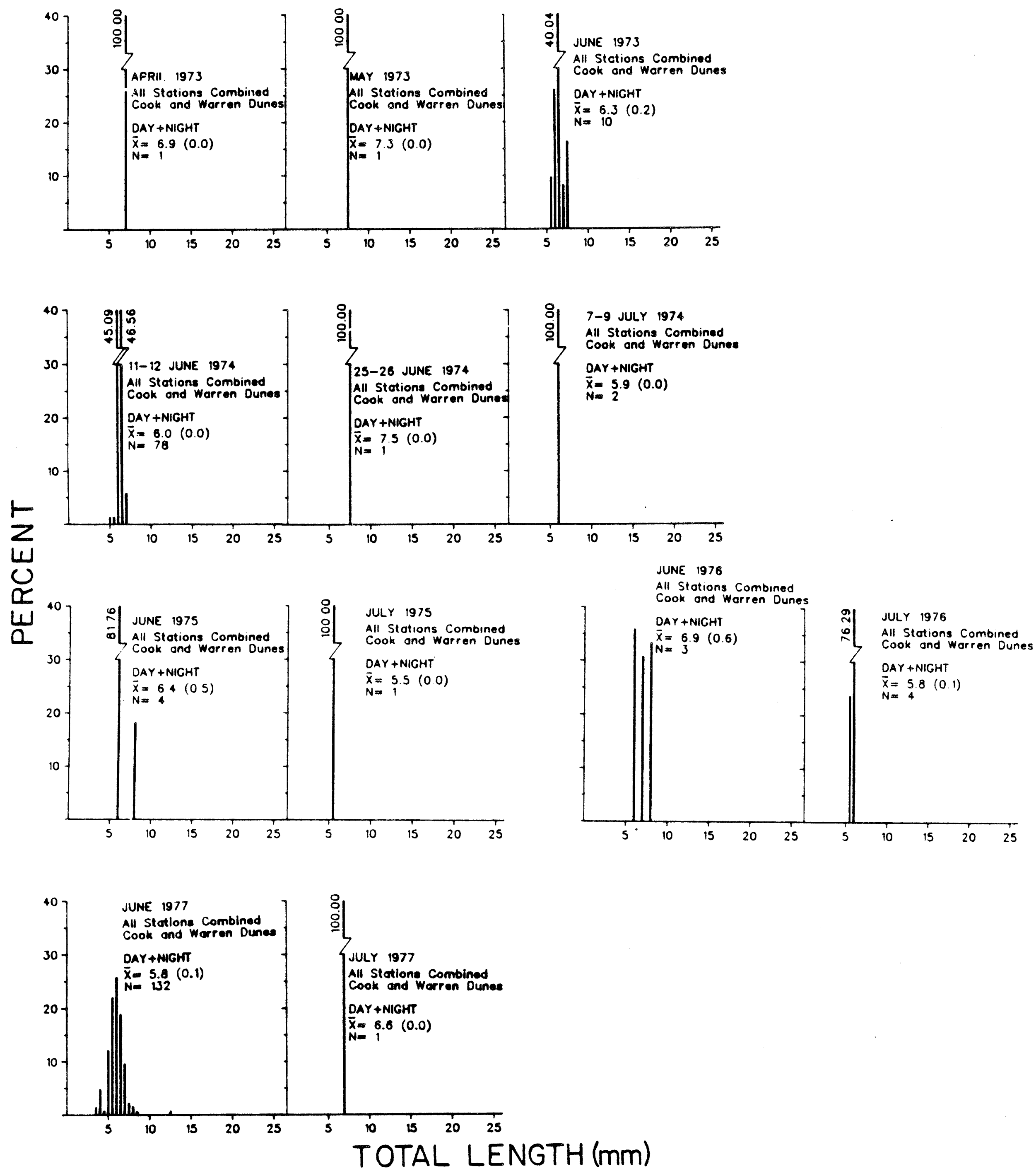

Figure 19. Length-frequency distributions of yellow perch larvae collected at all stations combined at the D. C. Cook Plant, 1973-1979. N = number of larvae, $\bar{X}$ = mean length, standard error given in parentheses.

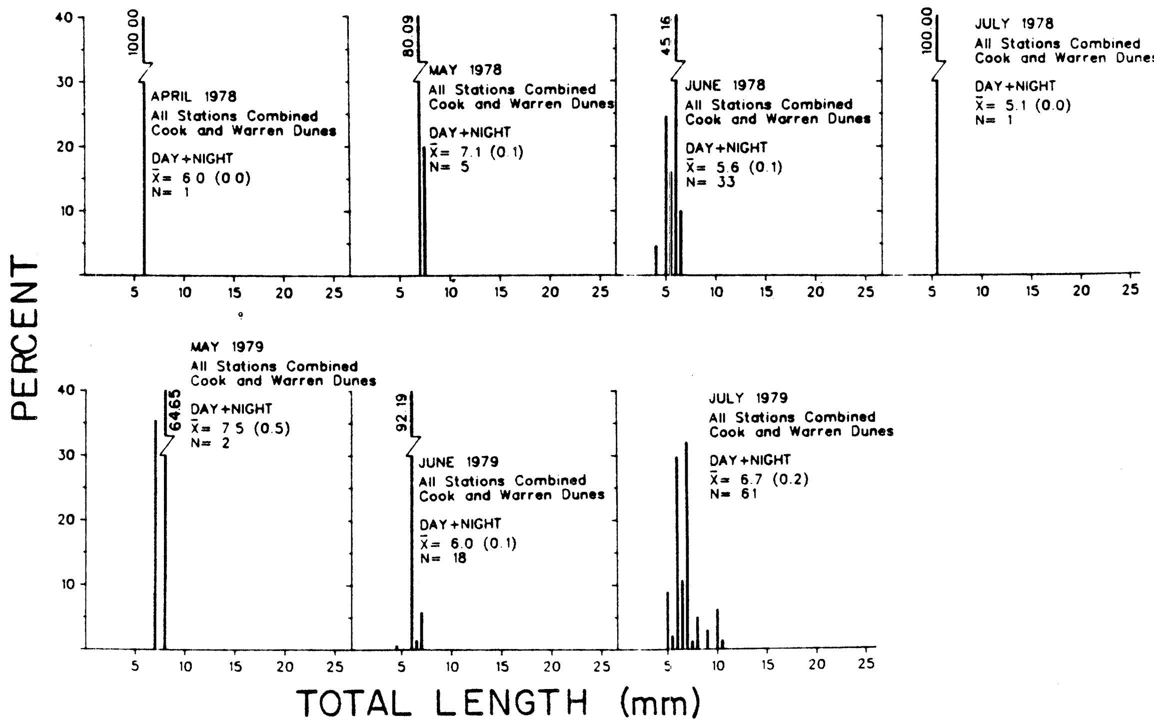

Figure 19. Continued.

beach stations than in open water. In 1974, when sampling was conducted weekly in May, smelt appeared at beach stations 2 wk earlier than at open water stations.

Other data did not support the suggestion of beach spawning and subsequent migration of larvae offshore. In April 1973, when beach samples were taken 2 wk before open-water samples, smelt larvae were collected in open water but not at the beach (Fig. 20). In 1979 a 7-mm larva was taken at station E (21 m) in July (Fig. 20); its origin (beach versus open water) was unknown. At the Campbell Plant, 105 km north of the Cook Plant, smelt apparently spawned in the open water zone in June as well as in the beach zone in April-May (Tin and Jude 1983, Jude et al. 1981).

Rainbow smelt larvae were equally abundant at 6- and 9-m stations but less common at 21-m stations. In 1973-1979, they were taken in 38 samples at stations C and G (6 m) and 41 samples at stations D and H (9 m) but in only 11 samples at stations E and W (21 m) in 1975-1979. Smelt occurred nearly uniformly through the water column at 6- and 9-m stations, except for their absence from surface samples in the daytime.

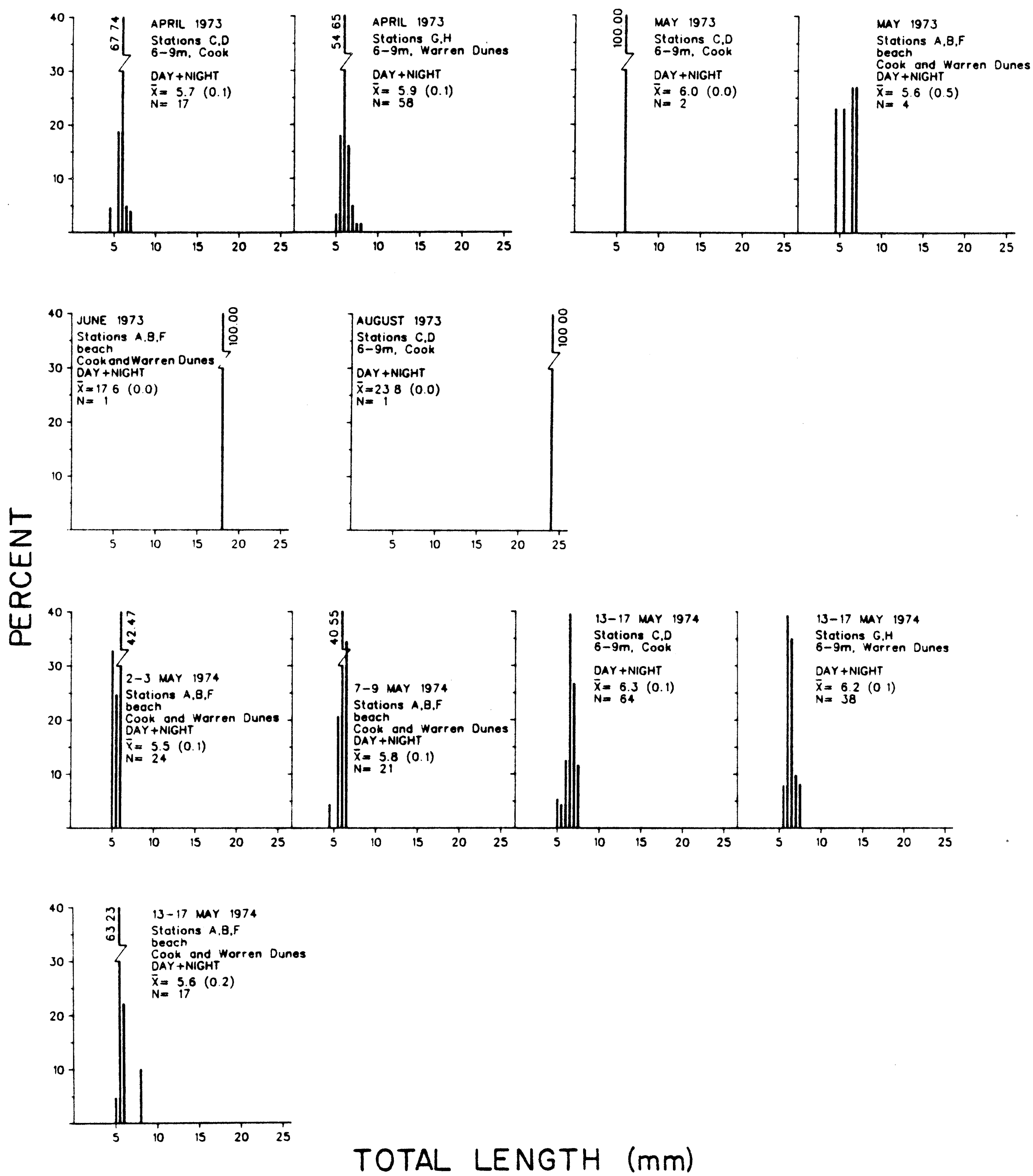

Figure 20. Length-frequency distributions of rainbow smelt larvae collected at beach and open water stations at the D. C. Cook Plant during 1973, 1974, 1975, and 1979. N = number of larvae, $\bar{X}$ = mean length, standard error given in parentheses.

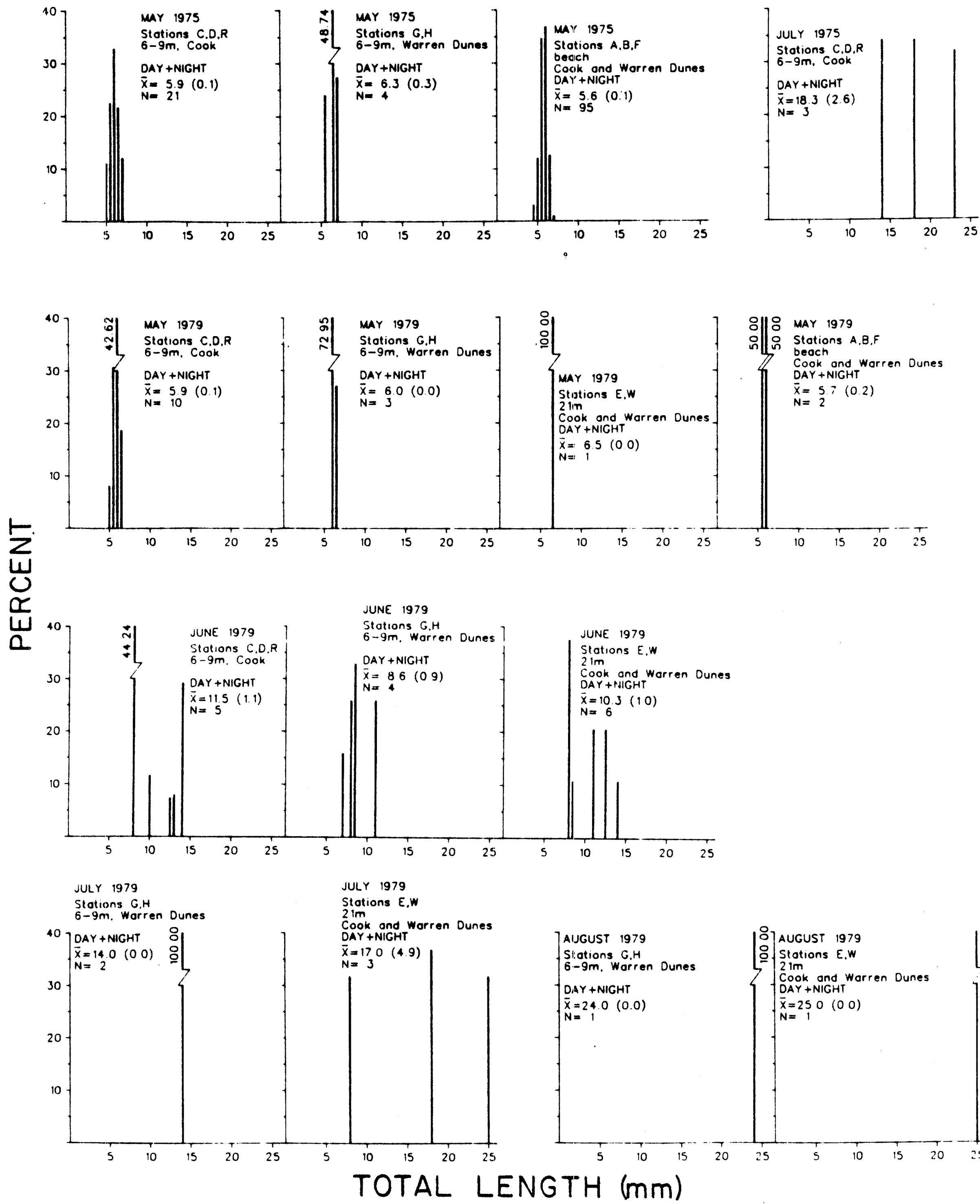

Figure 20. Continued.

The number of samples containing rainbow smelt larvae did not differ significantly between Warren Dunes and either north Cook or south Cook stations in preoperational versus operational years (north Cook: chi-square = 0.38, $P > 0.50$; south Cook: chi-square = 0.783, $P > 0.25$). The lack of significant differences implies no identifiable plant effect.

Less Abundant Species

Eleven species of larvae were captured in small numbers during 1973-1979. These included burbot, trout-perch, common carp, johnny darter, deepwater (formerly fourhorn) sculpin, slimy sculpin, ninespine stickleback, and unidentified members of the sucker, minnow, sculpin, and herring families. Burbot, trout-perch, common carp, and johnny darter were taken often enough to show regularities in distribution.

The 11 records of burbot larvae included seven in April, three in May, and one in June. They may have been present earlier than records show, as sampling occurred only 1 yr for January, February, and March. Most burbot larvae were 3.5-5.0 mm TL, i.e., recently hatched (Mansfield et al. 1983), with one 6-mm and one 14-mm larva also taken. Burbot larvae were found during 2 yr at Cook stations E (21 m) and C (6 m) and Warren Dunes station W (21 m). Burbot was the only less abundant species whose larvae were taken at stations E and W, which are the farthest offshore.

The 10 records of trout-perch larvae were spread over each of the months from May through October, which suggests that trout-perch had the longest season of spawning and hatching of any species considered in this report. All 5 yr of November samples yielded no trout-perch larvae. Most trout-perch larvae were 4-7 mm TL, that is, recently hatched (Auer 1982). The exception was an 8-mm larva taken in May 1978. Larval trout-perch occurred consistently at the same stations, with records at beach station A (north Cook) in each of the 5 yr 1974-1978. They were taken only twice at Warren Dunes.

Common carp larvae were taken 10 times, all in the period June through August, mostly in July. They occurred at Cook beach stations A (north Cook) and B (south Cook) and open water station R (6 m, north Cook) in 1975 and 1976. Carp were never taken in preoperational years 1973-1974 or at Warren Dunes. Carp spawned at Cook plant stations in operational years, and we attributed this to the warm-water plume and currents produced by the heated discharge of the Cook plant. Thus carp spawning at Cook was a clear plant effect.

Johnny darter larvae were recorded in seven samples, all in June and July. They occurred at Warren Dunes station H (9 m) and south Cook station D (9 m) in 1976 and 1977. Deepwater sculpin larvae were collected in April 1978 at 9-m Cook station D and in May 1979 at 9-m Warren Dunes station H. Each of the six other species occurred in 1 yr only during the period 1973-1979 (Appendixes 6-12).

Fish Eggs

General Abundance Trends--

In the beach zone, eggs were most abundant in 1978 and least abundant in 1977. Yearly geometric mean densities (number per 1,000 m^3) pooled over the months June through August for 1973 through 1979, were, respectively, 340, 130, 8, 15, 7, 450, and 11. In the open-water zone mean densities were much lower. For the years 1974 through 1979, based on the months June and July, yearly geometric means were 29, 38, 15, 3, 5, and 20, respectively. The year of peak abundance was 1975, and the lowest abundance year was 1977. Mean densities differed significantly among years at both beach and open water stations (ANOVA, $P < 0.01$). Yearly abundance trends in the beach and open water zones were uncorrelated (Spearman rank correlation coefficient = 0.01).

Species Composition--

Eggs were not identified to species, but based on the biology of the common species we could rule out all but alewife in open water samples and all but alewife and spottail shiner in the beach zone (except for eggs collected in the beach zone in January 1974 that were presumed to be burbot). During the season of high egg abundance, May through August, only four common species spawned in the study area: alewife, spottail shiner, rainbow smelt, and yellow perch. Yellow perch eggs are demersal and enclosed in a gelatinous mass and were thus generally unavailable to our nets. In addition, they were easily identified. Rainbow smelt spawn demersal, adhesive eggs with a stalk, chiefly before our May sampling period. Spottail eggs are likewise demersal and adhesive and should have been taken only when the water was turbulent enough to suspend them in the water column; this was likely in some beach samples. Only alewives spawn in the water column, though their eggs eventually sink to the bottom (Auer 1982). Thus, unless eggs were washed upward from the bottom by mechanical action, only those of the alewife should have been taken in the open water zone.

Seasonal Occurrence--

Occurrence of fish eggs was distinctly seasonal, with abundance rising sharply by June and falling sharply by August. Eggs were scarce or absent until June of most years at beach stations and every year at open water stations. In the beach zone, eggs first appeared in May 1973, 1975, and 1978. Eggs persisted in the beach zone through July in 1975 and 1979, August in 1976 and 1978, September in 1973 and 1977, and November in 1974 (Figs. 5-11).

Not only did eggs occur over a longer span each year in the beach zone than in open water, but egg densities were higher as well. In every month of every year that eggs were present, mean abundance was greater in the beach zone. Densities at 6-m stations usually exceeded those at 9-m stations; only in June 1975 and June 1978 did the reverse occur. For all 6 yr considered, the difference in fish egg densities between the 6- and 9-m contour fell short of statistical significance (ANOVA, $P < 0.05$). Overall geometric mean density in nighttime samples in June and July, 1974-1979, was 9 at 9-m stations D and H and 18 at 6-m stations C and G.

Diel Distribution--

At beach stations, eggs were significantly more abundant in nighttime samples (ANOVA, $P < 0.01$); exceptions were June and July 1974, July 1976, July 1977, and June 1979. At open water stations, more than 99% of the eggs were taken at night. Alewives are nocturnal spawners which broadcast demersal eggs (Graham 1956, Mansueti and Hardy 1967). The diel difference between the beach and open water zones probably occurred because eggs in open water sank to the bottom by mid- or late afternoon, when samples were taken, and were thus unavailable to daytime nets, while eggs at the beach remained suspended in the water column by wave action or disturbance and by seining. The major conclusion is that total abundance and diel distribution of eggs in beach and open water zones differed but were not comparable, presumably because eggs in open water became unavailable to sampling gear within 24 h of being spawned.

Distribution at Cook Plant Versus Warren Dunes--

Mean abundance of eggs in June through August 1973 to 1979 did not differ significantly among beach stations A, B, and F (ANOVA, $P = 0.05$), but each of the three stations followed a separate pattern through the years. Geometric mean egg densities were 5 at station A, 33 at station B, and 39 at station F (Warren Dunes) for all years. Cook station A had highest densities in 10

individual cases, including all three summer months in 1976 and 1977. Station B had the most eggs twice, in June 1973 and July 1975. Station F produced the greatest densities six times, including July and August of preoperational years 1973 and 1974. Considering that egg abundance at Warren Dunes station F generally fell between those of Cook stations A and B, no trend attributable to plant operation was identified.

Geometric mean abundance of eggs in nighttime samples in June and July 1974-1979 differed significantly between Warren Dunes and Cook plant areas in open water (ANOVA, $P < 0.01$). Cook stations C and D together (all depth strata combined) averaged 44 eggs per 1,000 m^3, while Warren Dunes stations G and H averaged 4 eggs per 1,000 m^3. At the Cook plant, abundance varied widely from month to month and year to year, from highs of 1,200/1,000 m^3 in July 1975 and 880/1,000 m^3 in June 1974 to a low of zero in July 1977 and 1978. Geometric mean densities at Warren Dunes stations varied from only 20/1,000 m^3 in June 1976 to zero in July of 1974, 1977, 1978, and 1979. Mean abundance in the Cook plant area was similar to or greater than mean abundance at Warren Dunes in every month of every year, except June 1978. Years of high and low abundance were uncorrelated in the two areas (Spearman rank correlation = -0.01).

Because eggs at open water stations were presumably all alewives, egg abundance data are inconsistent with the fact that densities of newly hatched alewife larvae were similar at Cook and Warren Dunes during the study period. The probable explanation of the difference in egg abundance between the two areas is that of systematic differences in egg sampling times at the four stations. Egg abundance increased steadily from dusk to shortly after midnight (Table 7), presumably reflecting an increase in spawning. Eggs were much more abundant after 2300 h than before, and peaked after midnight. The stations were most often sampled in the sequence Warren Dunes (9 m, 6 m), followed by Cook Plant (9 m, 6 m), and egg abundance increased in the same order (Table 8). In the few instances in which Warren Dunes stations were sampled later than Cook stations, egg abundance differences between the areas were reversed (July 1978), or obscured (June 1975), or else neither area produced eggs (July 1977, July 1978). In all cases where Cook stations were sampled later, they produced more eggs. In short, the area sampled last always produced as many or more eggs than the area sampled first; and a median difference of less than 2 h in sampling time between Cook Plant and Warren Dunes produced an 11-fold difference in geometric mean egg densities.

Table 7. Mean density of fish eggs in relation to sampling time. Samples were collected at night in June and July, 1973-1979. Data were pooled over 6- and 9-m stations C, D (Cook), G, and H (Warren Dunes) and all depth strata.

Time Interval (h)	Number of Sampling Periods	Mean Density (no./1,000 m^3)
2000-2059	3	33
2100-2159	7	61
2200-2259	10	171
2300-2359	10	348
2400-0059	6	3,395
0100-0159	7	2,419
0200-0259	2	276
0300-0359	1	15,546

Table 8. Station differences in egg abundance and sampling time. Densities were pooled over nighttime samples from all depth strata, June and July, 1973-1979. N = 248 samples.

Station	H (9 m, Cook)	G (6 m, Cook)	D (9 m, Dunes)	C (6 m, Dunes)
Median Time of Sample (h)	2213	2301	2330	0118
Median Density (No./1,000 m^3)	7	54	350	654

Comparison of field-caught and entrained fish eggs--

A chief aim of field sampling of fish eggs was to allow comparison with the abundance and season of occurrence of entrained eggs. Field samples from the 6- and 9-m depth contours were used for comparison with entrainment samples because the

cooling water intake was located between those two depths. Of five sampling stations at those depths (Cook stations C - 6 m, D - 9 m, R - 6 m; Warren Dunes stations G - 6 m, H - 9 m), the three at Cook Plant were used. Warren Dunes was omitted because egg densities differed greatly between Cook and Warren Dunes. Entrainment densities were assumed to be more similar to those observed at Cook stations (i.e., near the water intake) than at Warren Dunes.

All monthly field samples, May through August, were used, giving a total of 20 comparisons between field-caught and entrained eggs (4 mo in each of 5 yr). April and September field samples were omitted because they usually lacked eggs. We used entrainment samples taken on the nearest date and in the same diel period as field samples (Table 9).

Table 9. Sampling dates used to compare field-caught and entrained eggs at the Cook Plant, May through August, 1975-1979. F = field, E = entrainment.

	Diel	1975		1976		1977		1978		1979	
Month	Period	F	E	F	E	F	E	F	E	F	E
May	Day	14	12	12	10	19	15	10	8	8	7
	Night	15	13	14	11	19	16	10	9	10	8
Jun	Day	10	10	22	22	15	13	14	12	12	6
	Night	10	11	22	23	16	14	22	18	13	7
Jul	Day	15	15	15	16	12	11	11	9	10	9
	Night	16	16	13	12	27	27	11	10	10	10
Aug	Day	12	11	10	10	9	7	9	7	8	7
	Night	13	12	11	9	10	8	29	29	16	16

Field densities were greatest in 1979, followed in order by 1975, 1976, 1978, and 1977 (Table 10). Entrainment densities were greatest in 1978, followed by 1976, 1979, 1975, and 1977. Densities of fish eggs in field and entrainment samples were uncorrelated (Spearman rank test, r = -0.03). Furthermore, the month of highest egg abundance, which was always either June or July, differed between field and entrainment samples in 3 of the 5 yr (1975, 1977, and 1979). The lack of correspondence in

timing of peak abundance, either year to year or month to month, suggested that the two sets of samples were drawn from different populations of eggs.

Egg densities in entrainment samples exceeded densities in field samples in all 5 yr and in almost every diel period and month each year (Table 10). Furthermore, entrainment densities for all years combined were seven times as great as field densities, i.e., 163,486 versus 24,930 (Table 10). Only in June 1979 did mean field egg density exceed entrained egg density, but even then, greater field densities probably resulted from differences in sampling dates. During 1979 no eggs were taken in entrainment samples on 7 June, but field samples, taken a week later on 13 June, contained large numbers of fish eggs. Because alewife larvae had not yet occurred in field samples on 13 June, alewife spawning probably began after the 7 June entrainment samples were collected, leading to the disparity observed between entrained and field-caught eggs.

The simplest interpretation of the lack of correlation between egg densities in field and entrainment samples is that we sampled two different egg populations. Some entrained water almost certainly was drawn from the lake bottom, where eggs eventually collected. Field plankton nets, in contrast, stayed above bottom and only sampled freshly deposited eggs or those stirred from the bottom because of currents or wave action. Evidence for a lake-bottom source of entrained eggs is that entrainment egg densities (summed over all 5 yr) were nearly five times as great as field densities at night (120,364 vs. 24,760) and about 254 times as great in daytime (43,122 vs. 170). Alewife eggs must have sunk to the bottom after spawning, because they were nearly absent from daytime field collections, yet 26% of entrained eggs were taken in daylight hours. Therefore nearly all day-entrained eggs must have come from the lake bottom. Eggs from the lake bottom presumably elevated night entrainment densities over night field densities as well. That alewife eggs were common on the bottom during these times was confirmed by divers' observations. Alewife eggs were also found in the stomachs of demersal feeders such as yellow perch (unpublished data, Great Lakes Res. Div., Univ. of Mich., Ann Arbor, Mich.).

Table 10. Mean monthly densities (no./1,000 m³) of fish eggs in field and entrainment samples at the D. C. Cook Plant, 1975-1979. Entr. = entrainment.

Month	Sample Type	Diel Period	1975	1976	1977	1978	1979
May	Field	Day	0	0	0	20	0
		Night	10	0	0	0	0
	Entr.	Day	255	47	1	0	17
		Night	41	10	0	0	4
Jun	Field	Day	60	0	50	0	0
		Night	500	430	110	460	6,870
	Entr.	Day	1,866	1,996	1,521	3,050	0
		Night	7,142	11,310	7,134	57,280	0
Jul	Field	Day	10	30	0	0	0
		Night	6,380	4,470	180	0	5,350
	Entr.	Day	225	26,881	1,330	4,175	1,200
		Night	1,216	10,800	141	13,773	10,460
Aug	Field	Day	0	0	0	0	0
		Night	0	0	0	0	0
	Entr.	Day	0	53	0	1,035	5
		Night	6	130	0	0	147
Total	Field	Day	70	30	50	20	0
		Night	6,890	4,900	290	460	12,220
	Entr.	Day	2,346	28,977	2,853	8,360	1,600
		Night	8,405	22,250	7,275	71,053	11,364

ENTRAINMENT

Sampling Adequacy

Over 2,400 entrainment samples containing nearly 11,500 fish larvae and almost 366,000 eggs were processed from 1975 to 1979 (Table 11). Standard series sampling (see Methods) accounted for from 53% of those samples collected in 1975 to almost 90% of those collected in 1979. Supplemental samples were 44% of those collected in 1975 to 9% in 1979. Approximately 2% of all samples were discarded or not used in our analyses. Sixty percent of all fish larvae were collected in 1975 and 1976 (3,960 and 2,860 larvae) (Table 12). The numbers of larvae collected in entrainment samples during 1977 and 1979 were similar (1,888 and 1,955 larvae). Only 528 fish larvae were collected in 1978. Most (83%) fish larvae were alewives, 4% were spottail shiners, 2% were yellow perch, and rainbow smelt and johnny darter each contributed about 1%. The remaining species and groups added 1.5% (< 175 larvae) to these totals (Table 12). Approximately 6% of all larvae were severely damaged, making identification impossible, and 10 fish (< 0.09%) remained unidentified as a result of incomplete taxonomic information.

As a result of the very large quantity of water used for condenser cooling at the Cook Plant, current entrainment sampling techniques allow the inspection of only a minor fraction of the total intake water volume (Tables 13 and 14). During 1975-1979, a mean of 0.00173% of the total annual flow was sampled. During June, July, and August of those years, entrainment sampling was doubled (weekly) and the percentage of volume sampled increased to 0.00318% for the 3-mo period. During one-unit operation (1975-1977), June-August sample volumes were 0.00409% of the total; when Unit 2 went on-line in 1978 and 1979, sample volumes dropped to 0.00182% of the total June-August flow.

Sampling during 1974 --

During 1974, samples were collected during one 24-h period about once per month. Samples were collected every 6-h at grates 2 and 3. The plant circulated water sporadically during 1974 and an adequate sampling design was not developed. However, testing of equipment was accomplished. These data are reviewed by Jude et al. (1979b) and Jude and Godun (1978).

Table 11. Actual numbers of fish eggs and larvae observed in entrainment samples from the D. C. Cook Plant forebay, 1975-1979. Data include all entrainment samples collected.

Species	Sample category: Standard series	Supplemental series	Discarded samples	Total	Percent total
Alewife	6,986	2,436	38	9,460	82.6
Spottail shiner	331	159	7	497	4.3
Yellow perch	200	8		208	1.8
Johnny darter	83	41		124	1.1
Rainbow smelt	68	23	6	97	0.9
Trout-perch	30	9		39	0.3
Mottled sculpin	26	6	1	33	0.3
Slimy sculpin	6	9	1	16	0.1
Common carp	11	4		15	0.1
Deepwater sculpin	2			2	<0.1
Burbot	2			2	<0.1
Ninespine stickleback	1			1	<0.1
Quillback	1			1	<0.1
Unidentified sculpins	23	5		28	0.2
Unidentified minnows	15	5		20	0.2
Unidentified darters	1	2		3	<0.1
Unidentified coregonids	1			1	<0.1
Poor condition larvae	513	174	6	693	6.1
Unidentified fish larvae	5	5		10	<0.1
Total larvae	8,305	2,886	59	11,450	
Fish eggs	224,829	131,430	409	365,668	

Table 12. Actual numbers of fish eggs and larvae observed in entrainment samples from the D. C. Cook Plant forebay, 1975-1979. Data include standard series and supplemental entrainment samples.

Species	Year 1975	1976	1977	1978	1979	Total
Alewife	3,310	2,646	1,437	395	1,634	9,422
Spottail shiner	180	36	209	24	41	490
Yellow perch	4	2	137	43	22	208
Johnny darter	3	17	52	10	42	124
Rainbow smelt	36	20	6	5	24	91
Trout-perch	15	6	5	1	12	39
Mottled sculpin	9	6	3		14	32
Slimy sculpin	9	3	1	2		15
Common carp		5	1	2	7	15
Deepwater sculpin				1	1	2
Burbot		1		1		2
Ninespine stickleback				1		1
Quillback			1			1
Unidentified sculpins	6	4	5	4	9	28
Unidentified minnows			3		17	20
Unidentified darters			3			3
Unidentified coregonids			1			1
Poor condition larvae	382	113	23	37	132	687
Unidentified fish larvae	6	1	1	2		10
Total larvae	3,960	2,860	1,888	528	1,955	11,191
Fish eggs	36,260	125,895	85,910	85,776	22,418	356,259

Table 13. Comparison of condenser water flow and volumes of water filtered for entrainment samples (1,000 m^3) at the D. C. Cook Plant, southeastern Lake Michigan, 1975-1979.

Year	Annual volume (1,000 m^3)		% sampled by entrainment gear	June-August volume (1,000 m^3)		% sampled by entrainment gear
	Condenser flow	Flow through entrainment gear		Condenser flow	Flow through entrainment gear	
1975	1,297,804	22.9	0.00176	333,237	11.4	0.00342
1976	1,291,865	32.7	0.00253	373,688	16.2	0.00434
1977	1,137,723	25.8	0.00227	320,469	14.5	0.00452
1978	2,369,699	25.1	0.00106	668,564	10.7	0.00160
1979	2,475,630	25.5	0.00103	585,561	11.9	0.00203

Table 14. Monthly water volume (millions of cubic meters) pumped through the condenser circulating water system of the D. C. Cook Plant, southeastern Lake Michigan from 1975 to 1979. Unit 1 was operational since January 1975, Unit 2 since February 1978.

Month	1975	1976	1977	1978	1979
January	64.9	85.7	24.9	114.4	273.2
February	75.6	88.5	54.5	121.6	275.2
March	117.7	103.6	118.7	207.1	281.9
April	121.0	76.2	114.5	115.9	173.7
May	125.8	86.0	97.4	90.4	100.5
June	122.8	122.7	93.5	194.4	33.3
July	81.7	120.5	103.6	224.5	227.7
August	128.7	130.5	123.3	249.6	324.6
September	125.2	109.0	97.7	277.6	314.3
October	132.2	137.9	112.4	298.8	245.9
November	90.6	126.2	76.3	202.8	107.3
December	111.6	105.1	120.9	272.5	118.0
Annual total	1,298.	1,292.	1,138.	2,370.	2,476.

Sampling during 1975 --

Entrainment sampling during 1975, with more consistent water circulation, was largely a testing and development year. Generally, samples were taken during four diel periods (discussed earlier). Grate 3 was sampled at 5 m and 9 m, Unit 1 discharge at 5 m, and occasionally samples were drawn from grates 1 and 2 (Table 15). Additionally, long entrainment sampling was performed for 12-h periods starting at noon or midnight to supplement regular sampling. Special studies of larvae and egg forebay heterogeneity were also conducted to examine their vertical and horizontal stratification in the forebay. Refer to the section of this report discussing forebay heterogeneity studies for more detail. In general, samples taken at grate 3 and the Unit 1 discharge at 5 m were the only samples collected in 1975 that are directly comparable with samples collected in subsequent years.

Sampling during 1976 --

All entrainment samples collected from 1976 to the present were from a depth of 5 m. January through June 1976 samples were similar to most samples collected in 1975 (grates 3N-S, Unit 1 discharge). In July, sampling began at grate 2 (Table 16). Standard series samples were collected monthly in January and February, twice per month from March to May and September to December, three times in June, and four times each in July and August. Supplemental sampling consisted of long entrainment runs (long day and long night samples) during April, May, July, and August.

Sampling during 1977-1979 --

Entrainment sampling from 1977 to 1979 was remarkably consistent. Standard series sampling was conducted at grates 2, 3S, 3N, and the Unit 1 discharge, all from a depth of 5 m (Tables 17-19). Samples were collected twice per month, except in June, July, and August when sampling occurred weekly. The plant was not operating in January and February 1977 and no sampling was performed. Supplemental samples (miscellaneous long duration entrainment samples) were collected during May, June, and July 1977, August 1978, and August 1979. When Unit 1 was not operating, Unit 2 discharge samples were substituted for standard series sampling.

Table 15. Locations and numbers of entrainment samples collected in the forebay at the D. C. Cook Plant in 1975. Depth: depth (m) of sampling in the forebay. Grate: the location of forebay grates, see Figure 3 for reference - (1) grate 1, (2) grate 2, (3N) grate 3-north, (3S) grate 3-south, (3ND) grate 3-no N or S designation, (5) grate 5, (7) grate 7, (U1) Unit 1 discharge. Data represent both standard series and supplemental entrainment samples.

			Grate							
Month	Total no. samples	Depth (m)	1	2	3N	3S	3ND	5	7	U1
Jan	8	5				3				5
Feb	8	5				4				4
Mar	8	5				4				4
Apr	16	5				8				8
May	40	5	4	4	5		3			14
		1			1		3			
		2					2			
		8					4			
Jun	77	5			26					25
		1				3				
		9				23				
Jul	121	5		3	25		12	3	3	26
		1				13				
		9				12	12			
		2					12			
Aug	108	5		9	27		1	9	7	31
		1				2	2			
		9				21				
Sep	19	5		7						8
		9				4				
Oct	15	5			4	4	4			3
Nov	21	5			4	4	6			7
Dec	34	5			8	8	8			10
Total	475		4	16	107	113	69	12	10	145

Table 16. Locations and numbers of entrainment samples collected in the forebay at the D. C. Cook Plant in 1976. Depth: depth (m) of sampling in the forebay. Grate: the location of the forebay grate, see Figure 3 for reference - (2) grate 2, (3N) grate 3-north, (3S) grate 3-south, (3ND) grate 3-no N or S designation, and (U1) Unit 1 discharge. Data represent both standard series and supplemental entrainment samples.

			Grate				
Month	Total no. samples	Depth (m)	2	3N	3S	3ND	U1
Jan	17	5		4	5		8
Feb	24	5		5	5	6	8
Mar	24	5		8	8		8
Apr	38	5		8	3	15	12
May	33	5		8	4	11	10
Jun	66	5		22	22		22
Jul	84	5	16	24	21		23
Aug	92	5	22	24	22		24
Sep	27	5	4	8	8		7
Oct	30	5	7	8	7		8
Nov	31	5	7	8	8		8
Dec	40	5	4	16	8		12
Total	506		60	143	121	32	150

Table 17. Locations and numbers of entrainment samples collected in the forebay at the D. C. Cook Plant in 1977. Depth: depth (m) of sampling in the forebay. Grate: the location of the forebay grate, see Figure 3 for reference - (2) grate 2, (3N) grate 3-north, (3S) grate 3-south, and (U1) Unit 1 discharge. Data represent both standard series and supplemental entrainment samples. The plant was not operating during January and February, 1977.

			Grate			
Month	Total no. samples	Depth (m)	2	3N	3S	U1
Mar	32	5	8	8	8	8
Apr	31	5	7	8	8	8
May	43	5	11	11	11	10
Jun	113	5	29	26	29	29
Jul	66	5	16	17	17	16
Aug	76	5	19	19	19	19
Sep	36	5	9	9	9	9
Oct	31	5	8	8	8	7
Nov	16	5	4	4	4	4
Dec	27	5	6	7	7	7
Total	471		117	117	120	117

Table 18. Locations and numbers of entrainment samples collected in the forebay at the D. C. Cook Plant in 1978. Depth: depth (m) of sampling in the forebay. Grate: the location of forebay grate, see Figure 3 for reference - (2) grate 2, (3N) grate 3-north, (3S) grate 3-south, (3ND) grate 3-no N or S designation, (U1) Unit 1 discharge, and (U2) Unit 2 discharge. Data represent both standard series and supplemental entrainment samples.

			Grate					
Month	Total no. samples	Depth (m)	2	3N	3S	3ND	U1	U2
Jan	27	5	5	8	6		8	
Feb	31	5	7	8	8		8	
Mar	31	5	8	8	8		7	
Apr	24	5	8	8	4		4	
May	32	5	8	8	8			8
Jun	51	5	12	13	13			13
Jul	75	5	19	19	19		4	14
Aug	78	5	17	18	21	1	8	13
Sep	36	5	9	9	9			9
Oct	27	5	8	4	7		4	4
Nov	31	5	7	8	8		8	
Dec	30	5	7	7	8		4	4
Total	473		115	118	119	1	55	65

Table 19. Locations and numbers of entrainment samples collected in the forebay at the D. C. Cook Plant in 1979. Depth: depth (m) of sampling in the forebay. Grate: the location of the forebay grate, see Figure 3 for reference - (2) grate 2, (3N) grate 3-north, (3S) grate 3-south, (U1) Unit 1 discharge, and (U2) Unit 2 discharge. Data represent both standard series and supplemental entrainment samples.

			Grate				
Month	Total no. samples	Depth (m)	2	3N	3S	U1	U2
Jan	27	5	8	3	8	8	
Feb	32	5	8	8	8	8	
Mar	28	5	8	8	4	8	
Apr	30	5	8	7	7	8	
May	27	5	8	5	8		6
Jun	53	5	15	10	16	12	
Jul	58	5	16	10	16	8	8
Aug	98	5	26	25	21	26	
Sep	33	5	9	8	7	8	1
Oct	29	5	8	8	5	8	
Nov	31	5	7	8	8	5	3
Dec	32	5	8	8	8	8	
Total	478		129	108	116	107	18

Forebay Heterogeneity Studies

An unknown variable in most entrainment studies is the possible stratification of organisms either vertically or horizontally in the water column where sampling is conducted. These potentially serious errors are usually ignored, or statements about the highly-mixed nature of the water segment studied are used to justify arbitrarily-chosen sampling locations. A preliminary study, conducted in 1974 using 15-min samples, was designed to test for vertical stratification of fish larvae and eggs in the forebay. However, this sample was too small and results were confounded by many zero data points.

The 1975 forebay heterogeneity study was originally reported by Jude (1976). We will briefly review those results. ANOVA examination indicated no significant differences for total larvae, alewife larvae, or egg densities (Tables 20-22). Densities (no./1,000 m^3) for total larvae were 98, 167, and 72 at 2 m, 5 m, and 8 m, respectively (Table 23). Alewife densities (no./1,000 m^3) were 72, 128, and 54, while egg densities were 1,106, 2,200, and 919 for the three depths. The 5-m sample means exhibited the greatest densities in all three categories. The 5-m depth was therefore selected as the depth at which the grate study and the annual seasonal sampling program was to be conducted.

The horizontal distribution study revealed that there were no statistical differences among sampling locations in the forebay (Tables 20-22). Means were similar at grates 2 and 5, but grate 7 fish egg and fish larvae densities were consistently (but not statistically) lower. This may have been the result of reduced water flow under grate 7 as a result of a current deflector in the vicinity (Fig. 3). In 1975 only Unit 1 was operating and the Unit 2 area of the forebay experienced much lower water flow velocities because most of the water for Unit 1 is drawn from under grates 1, 2, and 3. Data from both segments of this study indicated striking diel variation in entrainment rates (Table 23). In general, more larvae were collected at night. This pattern continued in subsequent years.

Data collected from 1977 to 1979 were examined for evidence of larvae and egg stratification in the forebay. ANOVA was used to compare differences in densities among various forebay grates and intake and discharge samples (Table 24). Data examined were collected during June, July, and August - months of peak abundance. No significant differences occurred among samples collected at grates 2, 3N, and 3S or all intake samples vs. all discharge samples. Some variation did occur in 1978, a year of reduced entrainment densities. Diel effects were significant for

Table 20. Analysis of variance summary of densities (no./1,000 m^3) for total larvae collected during depth-grate studies, 30 July-2 August 1975, in the D. C. Cook Plant forebay.

Source of variation	df	Mean square	F-statistic	Attained significance level
		Depth study		
Depth	2	21,246.293	2.515	0.407
Diel	5	35,512.023	4.203	0.354
Day	1	1,311.885	0.155	0.761
Depth X Diel	10	6,010.691	0.711	0.737
Depth X Day	2	2,839.836	0.336	0.773
Diel X Day	5	20,788.211	2.460	0.448
Depth X Diel X Day	9	8,923.789	1.056	0.664
Explained	34	14,680.488	1.738	0.547
Residual	1	8,449.188		
Total	35	14,502.449		
		Grate study		
Grate	2	765.432	0.526	0.597
Diel	5	2,175.754	1.496	0.225
Day	1	436.020	0.300	0.589
Explained	8	1,590.381	1.094	0.399
Residual	26	1,454.061		
Total	34	1,486.136		

Table 21. Analysis of variance summary of densities (no./1,000 m^3) for alewife larvae collected during depth-grate studies, 30 July-2 August 1975, in the D. C. Cook Plant forebay.

Source of variation	df	Mean square	F-statistic	Attained significance level
		Depth study		
Depth	2	13,908.098	2.572	0.403
Diel	5	15,480.473	2.863	0.420
Day	1	274.380	0.051	0.859
Depth X Diel	10	3,978.257	0.736	0.729
Depth X Day	2	3,811.068	0.705	0.644
Diel X Day	5	7,251.277	1.341	0.573
Depth X Diel X Day	9	4,695.961	0.868	0.689
Explained	34	7,296.254	1.349	0.605
Residual	1	5,407.313		
Total	35	7,242.285		
		Grate study		
Grate	2	901.558	0.685	0.513
Diel	5	2,087.310	1.586	0.199
Day	1	680.846	0.517	0.478
Explained	8	1,571.892	1.194	0.340
Residual	26	1,316.013		
Total	34	1,376.220		

Table 22. Analysis of variance summary of densities (log no./1,000 m^3) for fish eggs collected during depth-grate studies, 30 July-2 August 1975, in the D. C. Cook Plant forebay.

Source of variation	df	Mean square	F-statistic	Attained significance level
		Depth study		
Depth	2	0.838	0.227	0.802
Diel	5	1.002	0.332	0.857
Day	1	2.041	0.676	0.562
Depth X Diel	10	0.385	0.127	0.981
Depth X Day	2	0.485	0.161	0.870
Diel X Day	5	0.676	0.224	0.912
Depth X Diel X Day	9	0.624	0.206	0.945
Explained	34	0.675	0.223	0.958
Residual	1	3.021		
Total	35	0.742		
		Grate study		
Grate	2	0.526	0.913	0.414
Diel	5	2.120	3.677	0.012
Day	1	1.093	1.896	0.180
Explained	8	1.494	2.592	0.032
Residual	26	0.557		
Total	34	0.793		

Table 23. Mean densities (no./1,000 m^3) of fish larvae and fish eggs collected during vertical (depth study) and horizontal (grate study) distribution studies conducted 30 July-2 August 1975 in the D. C. Cook Plant forebay.

Depth Study

	Depth (m)			Time periods						Day		Grand mean
	2	5	9	1500-1900	1900-2300	2300-0300	0300-0700	0700-1100	1100-1500	30-31 July	1-2 August	
Total no. larvae	98	167	72	36	193	218	99	55	46	102	122	112
Alewife larvae	72	128	54	32	137	156	73	50	42	79	90	85
Fish eggs	1,106	2,200	919	560	501	4,760	1,113	610	216	2,334	483	1,409

Grate Study

	Grate			Time periods						Day		Grand mean
	2	5	7	1500-1900	1900-2300	2300-0300	0300-0700	0700-1100	1100-1500	30-31 July	1-2 August	
Total no. larvae	51	50	37	29	70	48	22	65	45	42	49	46
Alewife larvae	45	46	30	24	57	35	17	65	45	37	43	40
Fish eggs	86	46	63	51	105	122	75	17	10	66	64	65

Table 24. ANOVA examination of forebay heterogeneity and intake/discharge densities. Months examined included June, July, and August 1977-1979 standard series data for total larvae, alewife larvae, and fish egg (log catch +1) densities (* indicates significance at the 0.05 level).

		ANOVA Factor		
Year	Category	Intake vs. discharge	Intake grates 2, 3N, & 3S	Diel period
1979				
	Total larvae	0.8748	0.8491	0.0000*
	Alewife larvae	0.8225	0.8307	0.0002*
	Fish eggs	0.5203	0.8901	0.0025*
1978				
	Total larvae	0.1728	0.1415	0.0000*
	Alewife larvae	0.1104	0.2063	0.0002*
	fish eggs	0.8635	0.4250	0.7270
1977				
	Total larvae	0.5718	0.4376	0.0000*
	Alewife larvae	0.7496	0.6469	0.0000*
	Fish eggs	0.8917	0.7245	0.1740

almost every category, suggesting a strong diel variation in entrainment rates. These differences will be further detailed later in this report.

General Trends of Entrainment Losses, 1975-1979

An estimated 350 million fish larvae and almost 12 billion fish eggs have been entrained in the condenser circulating water system at the D. C. Cook Plant during the 5 yr from 1975 to 1979 (Tables 25-30 and Fig. 21). Thirteen species have been found in entrainment samples: alewife (*Alosa pseudoharengus*), spottail shiner (*Notropis hudsonius*), rainbow smelt (*Osmerus mordax*), yellow perch (*Perca flavescens*), trout-perch (*Percopsis omiscomaycus*), johnny darter (*Etheostoma nigrum*), slimy sculpin (*Cottus cognatus*), common carp (*Cyprinus carpio*), ninespine stickleback (*Pungitius pungitius*), mottled sculpin (*Cottus bairdi*), deepwater sculpin (*Myoxocephalus thompsoni*), burbot (*Lota lota*), and quillback (*Carpiodes cyprinus*). Additionally four groups could not be categorized to species: minnows, sculpins, coregonids, and darters. Approximately 6% of all fish larvae were damaged beyond recognition and less than 0.1% of all larvae were not identifiable at our current level of taxonomic sophistication (Table 1).

Entrainment of fish larvae generally began for the year in late March or April, peaked in June or July (corresponding to alewife spawning), and terminated in October or November as larvae and YOY fish migrated to deeper offshore zones. Alewife was the most abundant species entrained accounting for almost 85% (302 million) of the total number of larval fish entrained from 1975 to 1979 (Table 25). Spottail shiner was the second-most abundant species (3%), followed by yellow perch (1.5%), and rainbow smelt (0.8%). Johnny darter, trout-perch, common carp, and sculpins (mottled, slimy, and unidentified) were consistent but minor components of entrainment losses. Deepwater sculpin, ninespine stickleback, burbot, quillback, minnows, darters, and coregonids were rare.

Alewife

Seasonal abundance trends--

Alewife was always the most abundant species collected in Cook Plant entrainment samples. Entrainment estimates ranged from 27 million in 1977 to 126 million in 1979 (Tables 25-30). This species was entrained in almost every month from early April (1977), May (1975, 1976, and 1978), or June (1979) to late September (1975 and 1977), October (1976), or November (1978 and

Table 25. Estimates (in millions) of annual entrainment losses of fish larvae and fish eggs at the D. C. Cook Plant, southeastern Lake Michigan, 1975 to 1979. Calculations use actual reported flow rates of the circulating water system.

Taxon	Year of estimate					Total	% Total
	1975	1976	1977	1978	1979		
Alewife	63.708	53.7550	27.3888	31.098	125.6180	301.5678	86.7
Spottail shiner	3.41	0.9361	2.760	1.681	1.8228	10.6099	3.1
Yellow perch	0.17554	0.03807	1.3224	3.0655	0.3840	4.98551	1.4
Rainbow smelt	1.3608	0.4145	0.1795	0.3496	0.3726	2.6770	0.8
Johnny darter	0.0440	0.210	0.707	0.772	0.8105	2.5435	0.7
Trout-perch	1.079	0.2509	0.1456	0.0194	0.6288	2.1237	0.6
Common carp		0.0912	0.0235	0.175	0.3603	0.6500	0.2
Mottled sculpin	0.152	0.146	0.0483		0.131	0.4773	0.1
Slimy sculpin	0.2431	0.06092	0.0256	0.130		0.45962	0.1
Deepwater sculpin				0.178	0.0141	0.1921	<0.1
Ninespine stickleback				0.124		0.124	<0.1
Burbot		0.0202		0.102		0.1222	<0.1
Quillback			0.0628			0.0628	<0.1
Unidentified minnows			0.1248		0.8138	0.9386	0.3
Unidentified sculpins	0.1899	0.0892	0.0918	0.175	0.0905	0.6364	0.2
Unidentified coregonids			0.0850			0.0850	<0.1
Unidentified darters			0.0276			0.0276	<0.1
Poor condition	6.555	2.8642	0.4274	3.352	5.9935	19.1921	5.5
Unidentified larvae	0.1693	0.0349	0.0887	0.100		0.3929	0.1
Total larvae	77.08664	58.91119	33.5088	41.3215	137.0399	347.86803	
Total eggs	743.1879	2,269.4543	1,320.301	5,840.8138	1,392.5408	11,566.2978	

Table 26. Estimates (in millions) of entrainment losses of fish larvae and fish eggs during 1975 at the D. C. Cook Plant, southeastern Lake Michigan. Calculations use actual reported flow rates of the circulating water system. No fish eggs or larvae were found in entrainment samples between 1 January and 25 January or between 30 October and 31 December 1975.

Taxon	26 Jan-4 Mar	5 Mar-28 Mar	29 Mar-2 May	3 May-31 May	1 Jun-27 Jun	28 Jun-2 Aug	3 Aug-30 Aug	31 Aug-27 Sep	28 Sep-29 Oct	Total	% Total
Alewife				0.275	33.0	28.7	1.43	0.303		63.708	82.6
Spottail shiner					2.05	1.36				3.41	4.4
Rainbow smelt				1.17	0.0291	0.0367	0.125			1.3608	1.8
Trout-perch					0.122			0.206	0.751	1.079	1.4
Slimy sculpin					0.229		0.0141			0.2431	0.3
Yellow perch			0.126		0.0405	0.00904				0.17554	0.2
Mottled sculpin					0.152					0.152	0.2
Johnny darter							0.0440			0.0440	0.1
Unidentified sculpins					0.169	0.0209				0.1899	0.2
Poor condition				0.130	2.86	3.13	0.132	0.303		6.555	8.5
Unidentified larvae				0.108	0.0181	0.0432				0.1693	0.2
Total larvae			0.126	1.683	38.6697	33.29984	1.7451	0.812	0.751	77.08664	
Fish eggs	1.08		1.19	149.	438.	153.	0.893	0.0249		743.1879	

Table 27. Estimates (in millions) of entrainment losses of fish larvae and fish eggs during 1976 at the D. C. Cook Plant, southeastern Lake Michigan. Calculations use actual reported flow rates of the circulating water system. No fish eggs or larvae were found in entrainment samples between 9 December and 31 December 1976.

Taxon	1 Jan- 2 Feb	3 Feb 2 Mar	3 Mar 31 Mar	1 Apr- 2 May	3 May- 31 May	1 Jun- 2 Jul	3 Jul- 31 Jul	1 Aug- 26 Aug	27 Aug- 30 Sep	1 Oct- 31 Oct	1 Nov 8 Dec	Total	% Total
Alewife					0.134	8.83	39.5	4.91	0.287	0.0940		53.7550	91.2
Spottail shiner						0.163	0.356	0.136	0.213	0.0681		0.9361	1.6
Rainbow smelt				0.252	0.126		0.0365					0.4145	0.7
Trout-perch		0.0478					0.0829		0.0777		0.0425	0.2509	0.4
Johnny darter							0.210					0.210	0.4
Mottled sculpin						0.146						0.146	0.2
Common carp						0.0263	0.0447	0.0202				0.0912	0.2
Slimy sculpin						0.0536	0.00732					0.06092	0.1
Yellow perch						0.0289	0.00917					0.03807	0.1
Burbot				0.0202								0.0202	<0.1
Unidentified sculpin					0.0683	0.0209						0.0892	0.2
Poor condition			0.0713		0.0939	0.686	1.74	0.273				2.8642	4.9
Unidentified larvae						0.0349						0.0349	<0.1
Total larvae		0.0478	0.0713	0.2722	0.4222	9.9896	41.98659	5.3392	0.5777	0.1621	0.0425	58.91119	
Fish eggs	2.77	3.04	0.198	0.222	1.64	657.	1600	4.54			0.0443	2,269.4543	

Table 28. Estimates (in millions) of entrainment losses of fish larvae and fish eggs during 1977 at the D. C. Cook Plant, southeastern Lake Michigan. Calculations use actual reported flow rates of the circulating water system. No fish eggs or larvae were found in entrainment samples between 1 March and 4 April 1977 or between 1 October and 31 December 1977. No entrainment sampling was performed between 1 January and 28 February 1977.

Taxon	5 Apr-6 May	7 May-28 May	29 May-1 Jul	2 Jul-31 Jul	1 Aug-26 Aug	27 Aug-30 Sep	Total	% Total
Alewife	0.127	0.0258	10.2	11.7	4.79	0.546	27.3888	81.7
Spottail shiner			1.95	0.810			2.760	8.2
Yellow perch		0.0263	1.25	0.0461			1.3224	3.9
Johnny darter			0.529	0.178			0.707	2.1
Rainbow smelt	0.0679		0.0106	0.101			0.1795	0.5
Trout-perch			0.0207	0.0290	0.0335	0.0624	0.1456	0.4
Quillback	0.0628						0.0628	0.2
Mottled sculpin			0.0483				0.0483	0.1
Slimy sculpin		0.0256					0.0256	0.1
Common carp				0.0235			0.0235	0.1
Unidentified minnows	0.0668			0.0580			0.1248	0.4
Unidentified sculpins			0.0918				0.0918	0.3
Unidentified coregonids	0.0850						0.0850	0.3
Unidentified darters			0.0276				0.0276	0.1
Poor condition			0.140	0.197	0.0904		0.4274	1.3
Unidentified larvae	0.0887						0.0887	0.3
Total larvae	0.4982	0.0777	14.268	13.1426	4.9139	0.6084	33.5088	
Fish eggs	5.64	12.1	1,060	242.	0.561		1,320.301	

Table 29. Estimates (in millions) of entrainment losses of fish larvae and fish eggs during 1978 at the D. C. Cook Plant, southeastern Lake Michigan. Calculations use actual reported flow rates of the circulating water system. No fish eggs or larvae were found in entrainment samples between 5 April and 2 May or between 2 December and 31 December 1978.

Taxon	1 Jan- 28 Jan	29 Jan- 28 Feb	1 Mar- 4 Apr	3 May- 30 May	31 May- 2 Jul	3 Jul- 28 Jul	29 Jul- 25 Aug	26 Aug- 3 Oct	4 Oct- 1 Nov	2 Nov- 1 Dec	Total	% Total
Alewife				0.798	4.87	9.55	4.15	2.83	8.64	0.260	31.098	75.3
Yellow perch				0.167	2.56	0.269	0.0695				3.0655	7.4
Spottail shiner					0.136	0.740	0.805				1.681	4.1
Johnny darter					0.442	0.161	0.169				0.772	1.9
Rainbow smelt				0.0526	0.158		0.139				0.3496	0.8
Deepwater sculpin			0.178								0.178	0.4
Common carp							0.175				0.175	0.4
Slimy sculpin					0.130						0.130	0.3
Ninespine stickleback								0.124			0.124	0.3
Burbot			0.102								0.102	0.2
Trout-perch							0.0194				0.0194	<0.1
Unidentified sculpins					0.175						0.175	0.4
Poor condition					0.836	0.775	0.880	0.286	0.575		3.352	8.1
Unidentified larvae					0.100						0.100	0.2
Total larvae			0.28	1.0176	9.407	11.495	6.4069	3.24	9.215	0.260	41.3215	
Fish eggs	114.	0.0618		0.292	2,300	3,320	106.	0.344	0.116		5,840.8138	

Table 30. Estimates (in millions) of entrainment losses of fish larvae and fish eggs during 1979 at the D. C. Cook Plant, southeastern Lake Michigan. Calculations use actual reported flow rates of the circulating water system. No fish eggs or larvae were found in entrainment samples between 4 December and 31 December 1979.

Taxon	1 Jan-2 Feb	3 Feb-27 Feb	28 Feb-30 Mar	31 Mar-2 May	3 May-30 May[1]	31 May-30 Jun	1 Jul-28 Jul	29 Jul-25 Aug	26 Aug-1 Oct	2 Oct-29 Oct	30 Oct-3 Dec	Total	% Total
Alewife						2.25	90.0	27.3	4.50	1.50	0.0680	125.6180	91.7
Spottail shiner						0.0528	0.300	1.47				1.8228	1.3
Johnny darter						0.272	0.492	0.0465				0.8105	0.6
Trout-perch						0.0551	0.0977	0.104	0.0640	0.308		0.6288	0.4
Yellow perch						0.164	0.220					0.3840	0.3
Rainbow smelt				0.0991		0.0150	0.0375	0.221				0.3726	0.3
Common carp						0.0452	0.253	0.0621				0.3603	0.3
Mottled sculpin						0.131						0.131	0.1
Deepwater sculpin						0.0141						0.0141	<0.1
Unidentified minnow						0.0348	0.363	0.416				0.8138	0.6
Unidentified sculpin						0.0905						0.0905	0.1
Poor condition				0.0775		0.646	3.13	2.14				5.9935	4.4
Total larvae				0.1766		3.7705	94.8932	31.7596	4.5640	1.808	0.0680	137.0399	
Fish eggs	13.7	0.304	0.712	0.518	0.848	12.0	705.	659.	0.370	0.0888		1,392.5408	

[1]No fish larvae, only eggs, were found during the first monthly entrainment sampling period (7-8 May). Larvae were collected during the second sample period (24-25 May), but the plant was not operating during that period.

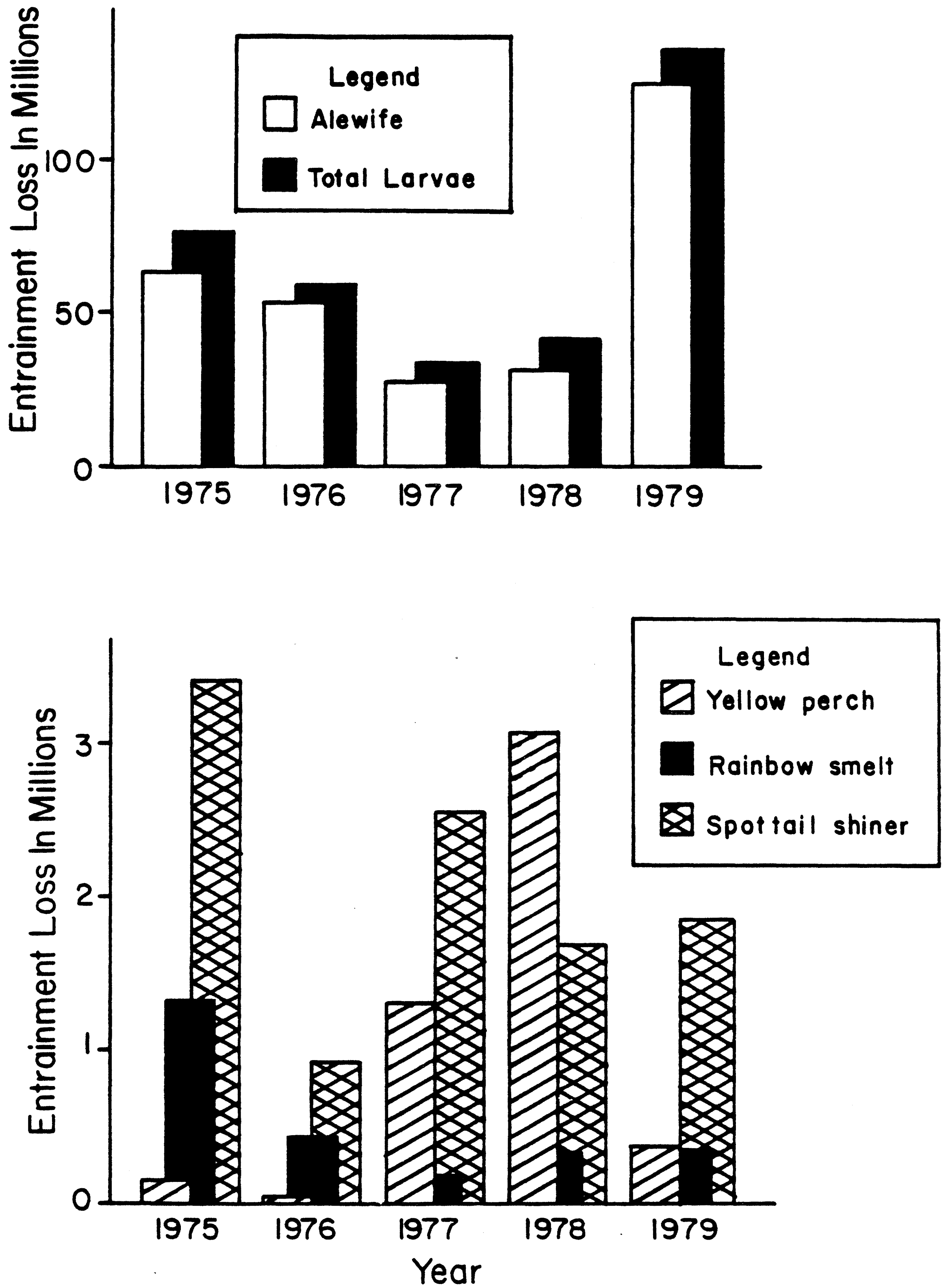

Figure 21. Entrainment losses at the D. C. Cook Plant, southeastern Lake Michigan, 1975-1979, for alewife, yellow perch, rainbow smelt, spottail shiner, total larvae, and fish eggs.

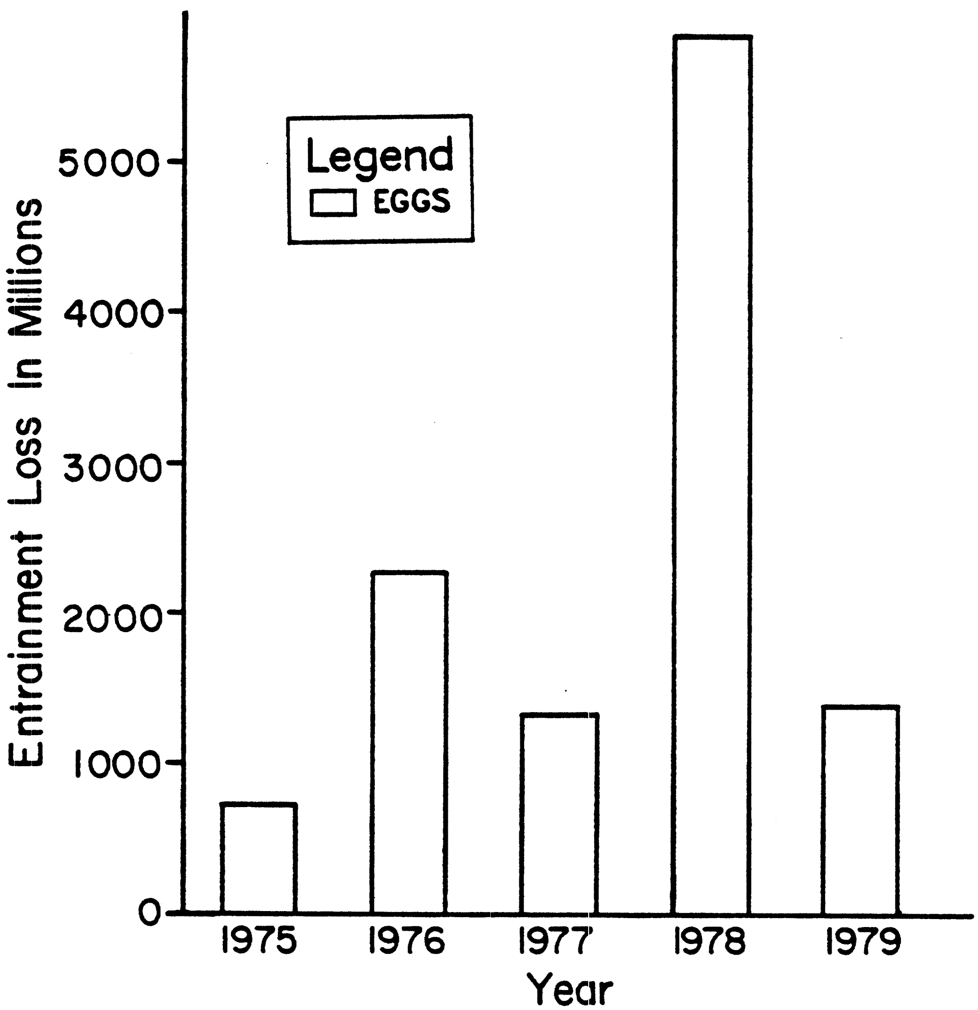

Figure 21. Continued.

1979). Entrainment peaks occurred in June (1975) or July (1976-1979). Yolk-sac larvae consistently appeared in entrainment samples as lake temperatures approached 15-18°C (Table 31 and Figs. 22-26). Data suggest that although alewife larvae were present in the nearshore areas at the Cook Plant for an extended period throughout the summer, densities usually peaked over a 1-3-wk period immediately following spawning and hatching. The greatest mean densities in a given month period (24-h sampling) for all samples combined were: 1,831 larvae per 1,000 m^3 (8-9 July 1975), 1,039 larvae per 1,000 m^3 (20-21 July 1976), 379 larvae per 1,000 m^3 (21-23 June 1977), 140 larvae per 1,000 m^3 (25-26 July 1978), and 892 larvae per 1,000 m^3 (26-27 July 1979) (Figs. 27-31). Greatest individual sample densities in each year were: 9,599 larvae per 1,000 m^3 (8 July 1975), 2,711 larvae per 1,000 m^3 (20 July 1976), 1,580 larvae per 1,000 m^3 (6 July 1977), 878 larvae per 1,000 m^3 (30 June 1978), and 2,606 larvae per 1,000 m^3 (26 July 1979). In all years the greatest overall monthly mean density occurred in July.

Annual alewife larvae entrainment density maxima from 1975 to 1979 appeared to be related to the thermal regime in the lake. The lowest annual peak density (140 larvae per 1,000 m^3) occurred during sampling on 25-26 July 1978. Mean June (13.7°C) and July (14.1°C) temperatures in that year were 12% and 21% lower than the 1975-1979 means (June - 15.5°C, July - 17.9°C). The second-lowest annual maximum mean density (379 larvae per 1,000 m^3) occurred during sampling on 21-23 June 1977 following relatively warm May (12.4°C, 1975-1979 mean - 11.0°C) water temperatures but cooler June (14.7°C) temperatures (Table 32). During 1975, the year of greatest annual maximum mean alewife density (1,831 larvae per 1,000 m^3 on 8-9 July), mean June (16.2°C) and July (19.5°C) temperatures were approximately 5% and 9% greater than 1975-1979 means. A similar pattern existed in 1976. In 1977 and 1978 reduced water temperatures appeared to be consistently related to the occurrence of repeated upwellings in late May and June.

Length-frequency distribution --

The majority of alewife larvae collected in Cook Plant entrainment samples were yolk-sac larvae ($\leq$ 5-mm TL, Auer 1982). The annual percentages falling into this category were: 1975 (94%), 1976 (73%), 1977 (77%), 1978 (74%), and 1979 (62%)(Tables 33-37). The relative abundance of larvae appeared to be related to offshore temperatures. Relatively few larger larvae were found in 1975 entrainment collections. Truncation of the length-frequency distribution may have been related to cooler August water temperatures (Table 32). Increased relative abundance of

Table 31. Mean densities (no./1,000 m³) of yolk-sac larvae and fish eggs collected at various water temperatures in the intake forebay at the D. C. Cook Plant, southeastern Lake Michigan. Data were collected during entrainment sampling from 1975 to 1979. Length ranges (mm TL) used in this analysis were: alewife (AL) ≤ 5, spottail shiner (SP) ≤ 5, rainbow smelt (SM) ≤ 6, yellow perch (YP) ≤ 8 (Auer 1982). SpP = species. The 7°C interval, for example, contains data from water temperatures from 6.1 to 7°C.

Yr/ Spp	Temperature (C)																				
	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	29
1975																						
AL			44	35	130	63	34	26	27	78	270	262	1032	84	206	295	358	831	319	104	29	198
SP					64					26	14	24	26	8	79	87	26	32		24		
SM	90	26	49					15		47		16			4							
YP										18		15			23		46					
Eggs	30	3992	297	157	4363	165	2098	27	79	418	1328	3058	4247	5003	3185	458	3141	5315	2544	1774	4239	1155
1976																						
AL					5	4		147	37	213	313		127	78	14	182	547	49				
SP											29		15	14		22	30					
SM	35	45				10																
YP													13			14						
Eggs		44			59	50	60	7325	284	2416	11275		12418	5355	4146	23553	11496	9397				
1977																						
AL			14	13			53	29	31		255	348	188	33	73	94	212					
SP								21	19		139	160	51	8	17		45					
SM				16																		
YP				35				373	79	12	14	69			31							
Eggs			133	535		195	2026	2199	25839	30303	10959	8515	7559	1900	9866	159	2227					
1978																						
AL				84	15		21	92	33		16	173		128	15		9					
SP								34				30		44	31							
SM		11						16				60										
YP		22	36	34		14	44	76				86		66								
Eggs		72	8689		649	17774	534	1670	16538		2852	30244		30398	6225	22	25	5				
1979																						
AL							65	57	27	246	62	334	32	6	244	51		74				
SP			37						24	31		64	7			12		13				
SM		23	69																			
YP							35		18	59												
Eggs			82				101	196	6004	4539	234	13817	1232	27	5193	162	10	143				

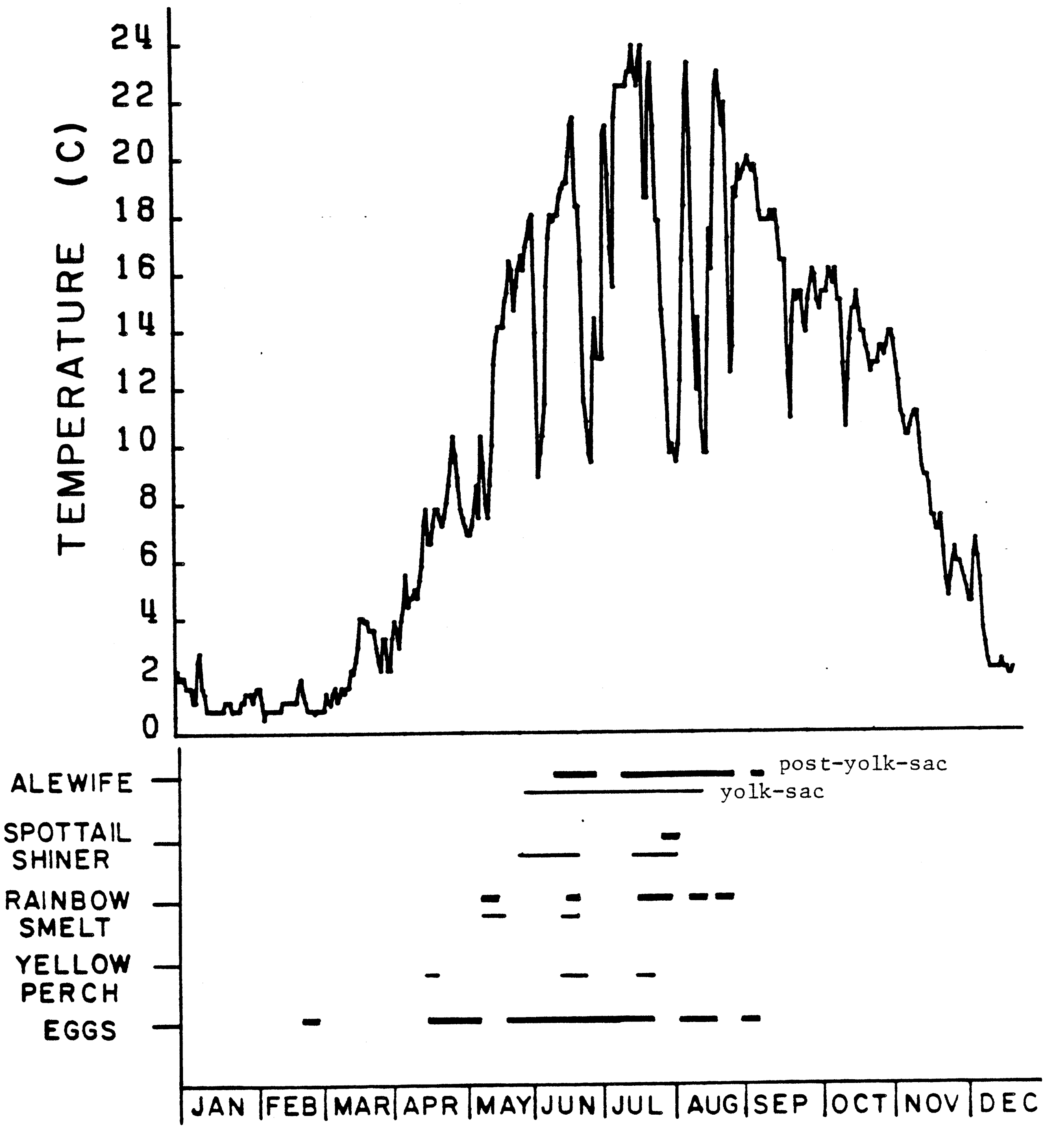

Figure 22. Seasonal distribution of alewife, spottail shiner, rainbow smelt, and yellow perch larvae, and fish eggs collected in entrainment samples at the D. C. Cook Plant, southeastern Lake Michigan, 1975. Also shown is the nearshore thermal regime at St. Joseph, Michigan.

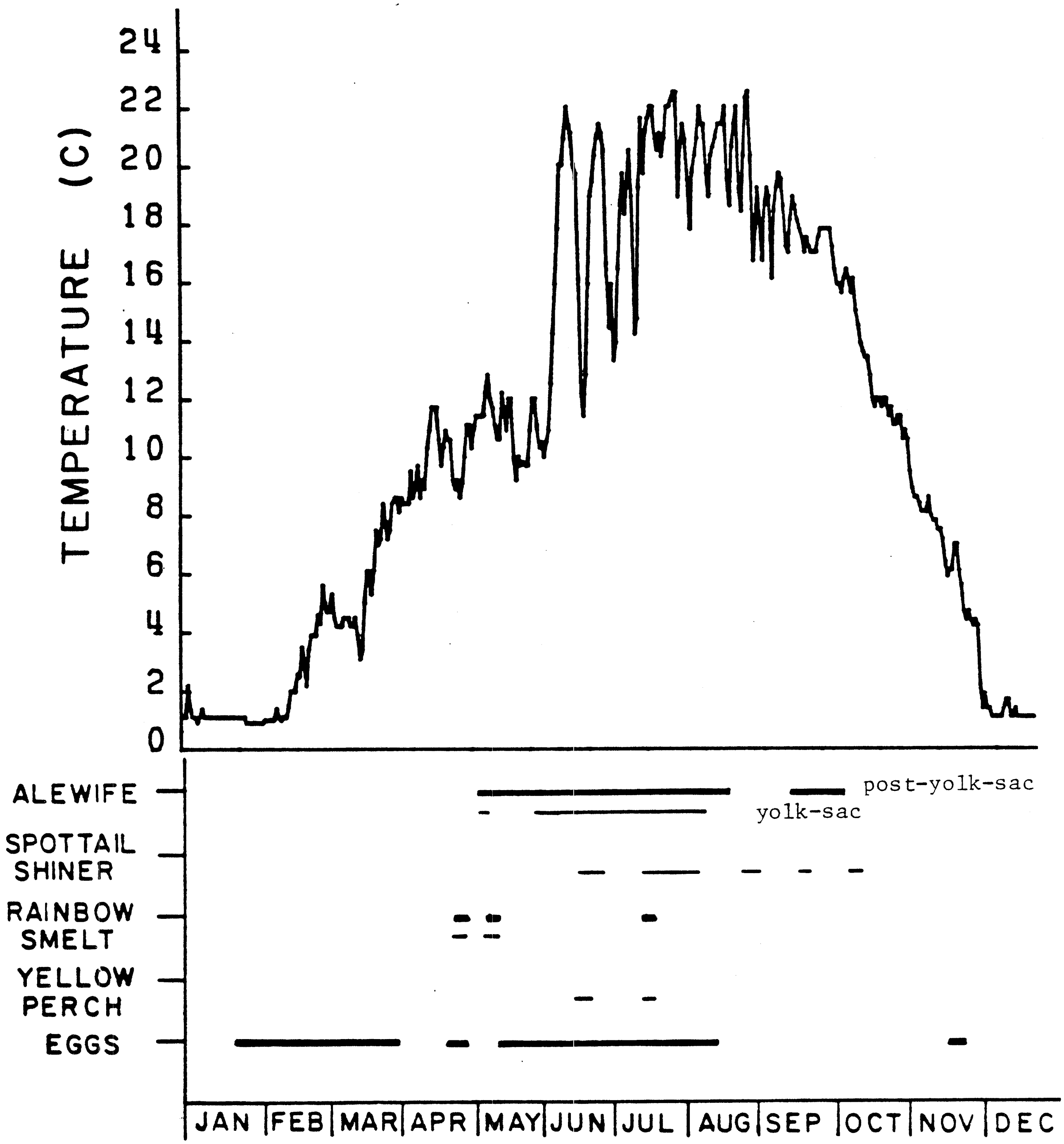

Figure 23. Seasonal distribution of alewife, spottail shiner, rainbow smelt, and yellow perch larvae, and fish eggs collected in entrainment samples at the D. C. Cook Plant, southeastern Lake Michigan, 1976. Also shown is the nearshore thermal regime at St. Joseph, Michigan.

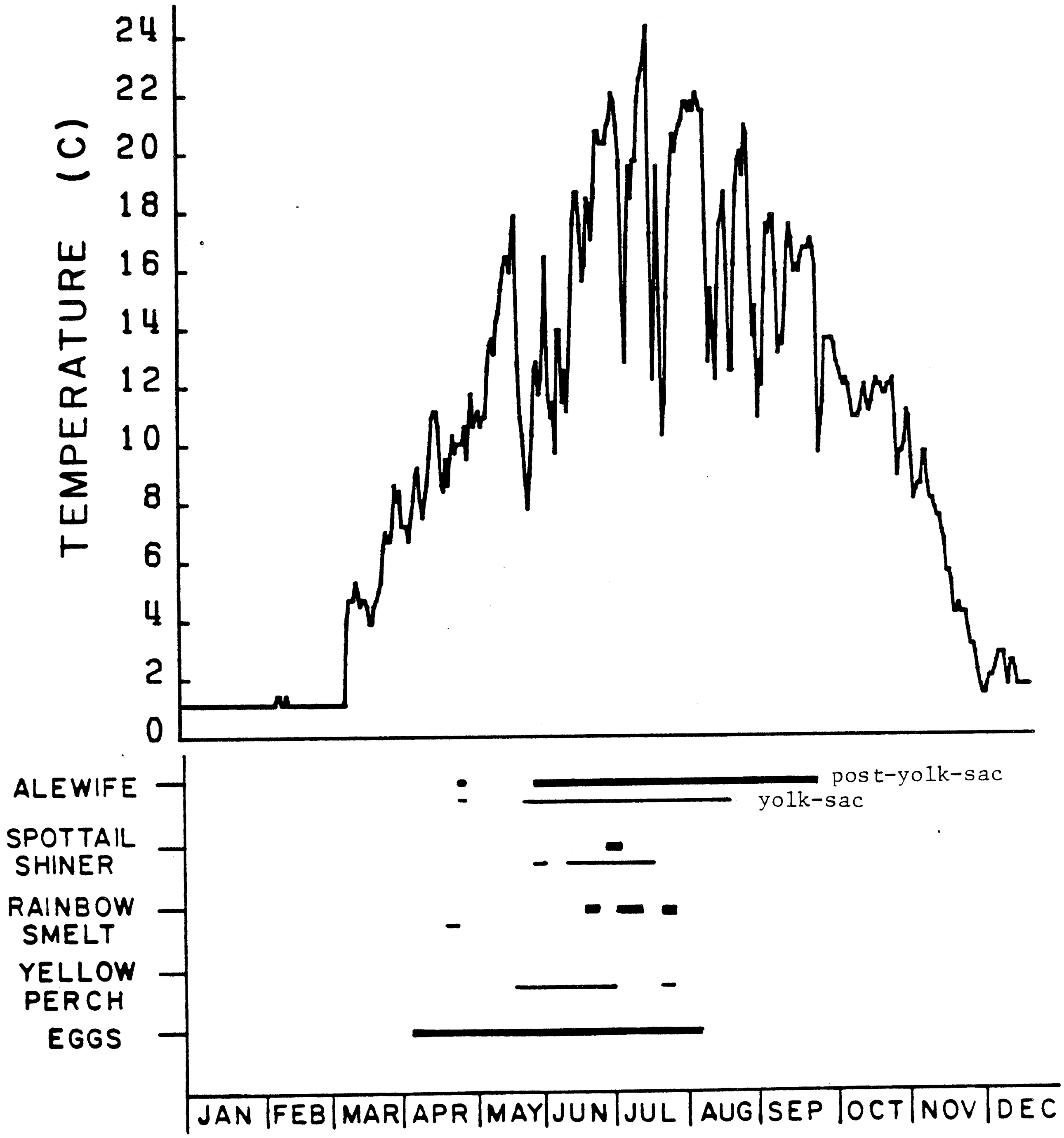

Figure 24. Seasonal distribution of alewife, spottail shiner, rainbow smelt, and yellow perch larvae, and fish eggs collected in entrainment samples at the D. C. Cook Plant, southeastern Lake Michigan, 1977. Also shown is the nearshore thermal regime at St. Joseph, Michigan.

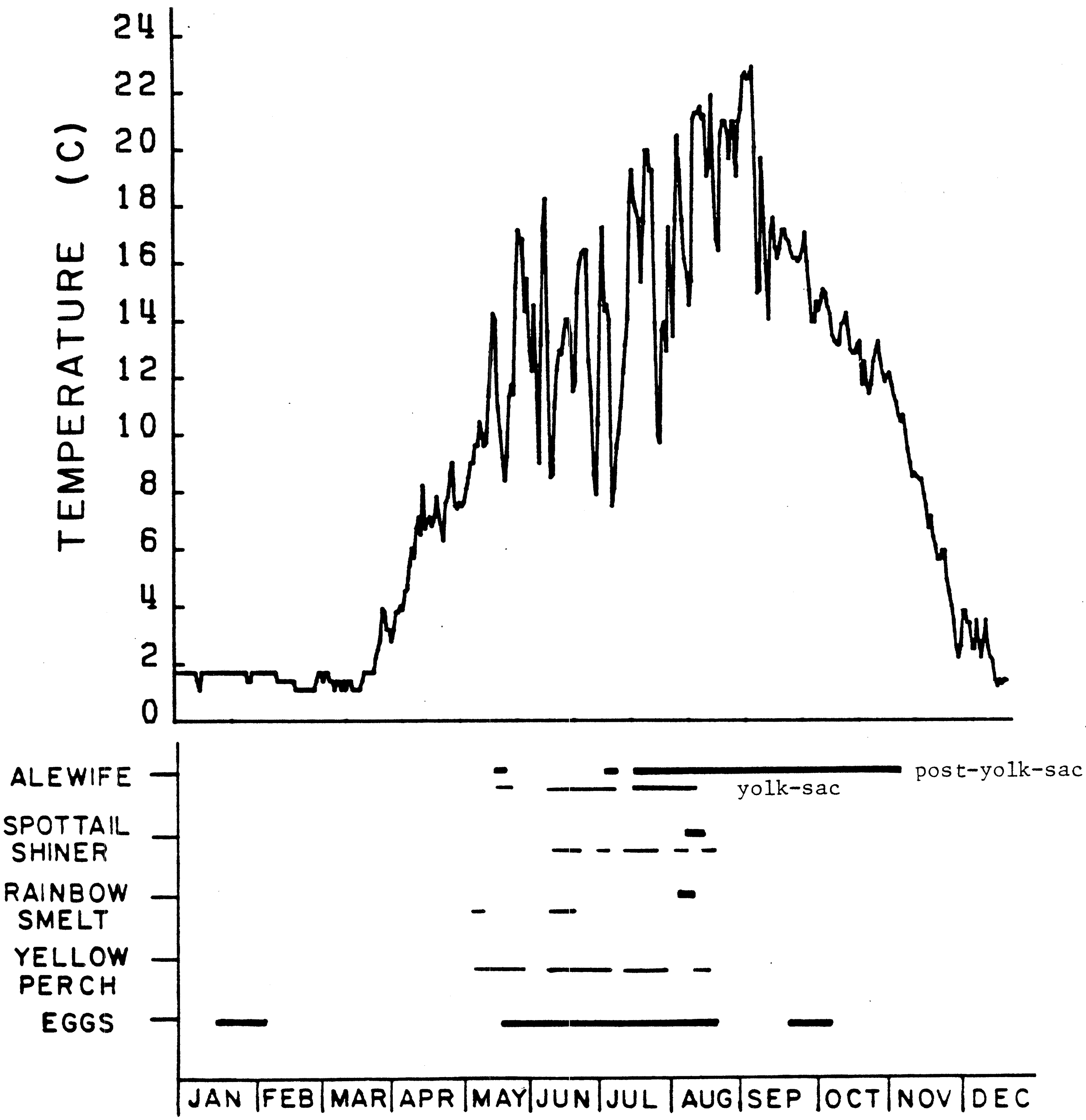

Figure 25. Seasonal distribution of alewife, spottail shiner, rainbow smelt, and yellow perch larvae, and fish eggs collected in entrainment samples at the D. C. Cook Plant, southeastern Lake Michigan, 1978. Also shown is the nearshore thermal regime at St. Joseph, Michigan.

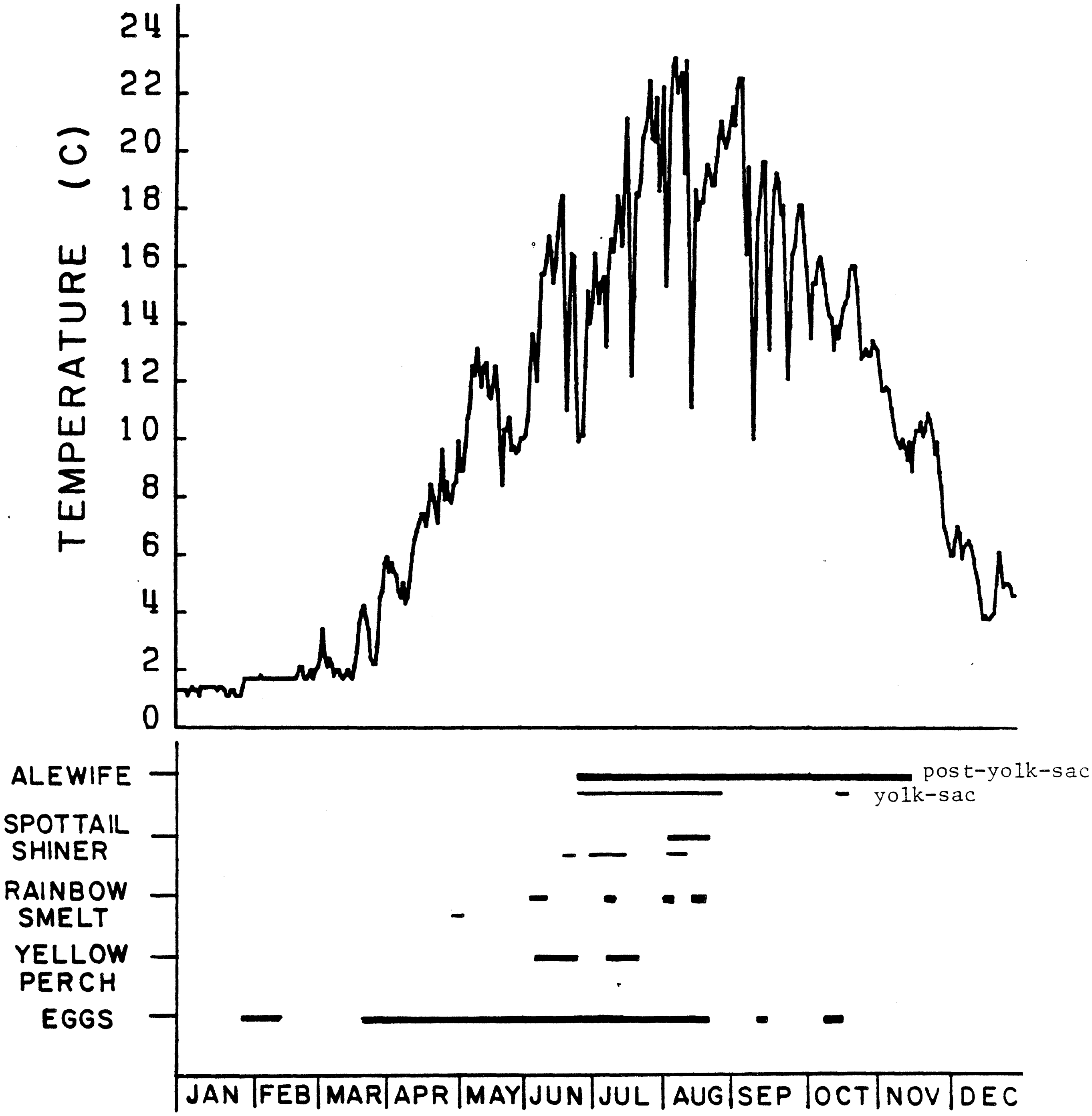

Figure 26. Seasonal distribution of alewife, spottail shiner, rainbow smelt, and yellow perch larvae, and fish eggs collected in entrainment samples at the D. C. Cook Plant, southeastern Lake Michigan, 1979. Also shown is the nearshore thermal regime at St. Joseph, Michigan.

Table 32. Lake Michigan water temperatures (°C) measured at the St. Joseph Municipal Water Plant, 16 km north of the Cook Plant, 1973-1979; intake depth - 6 m. Data are monthly means of the daily average of maximum and minimum temperatures.

	Month											
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1973	0.5	0.6	4.2	7.1	10.6	17.9	18.8	19.7	16.4	15.7	9.7	4.1
1974	1.2	1.1	3.7	7.5	11.3	14.9	17.2	16.5	16.2	13.3	9.2	3.0
1975	1.3	1.1	2.1	5.4	10.9	16.2	19.5	15.5	17.3	14.5	10.9	4.1
1976	1.1	2.1	5.4	9.6	11.0	16.7	19.2	20.5	18.0	14.6	8.3	2.0
1977	1.1	1.1	3.5	8.7	12.4	14.7	18.6	18.5	15.9	12.1	8.5	2.5
1978	1.7	1.4	1.5	5.6	10.2	13.7	14.1	17.9	18.4	14.0	10.1	3.1
1979	1.3	1.8	2.6	6.6	10.6	14.1	18.0	19.5	17.3	14.5	10.3	5.4
1973-1979	1.2	1.3	3.3	7.2	11.0	15.5	17.9	18.3	17.1	14.1	9.5	3.5

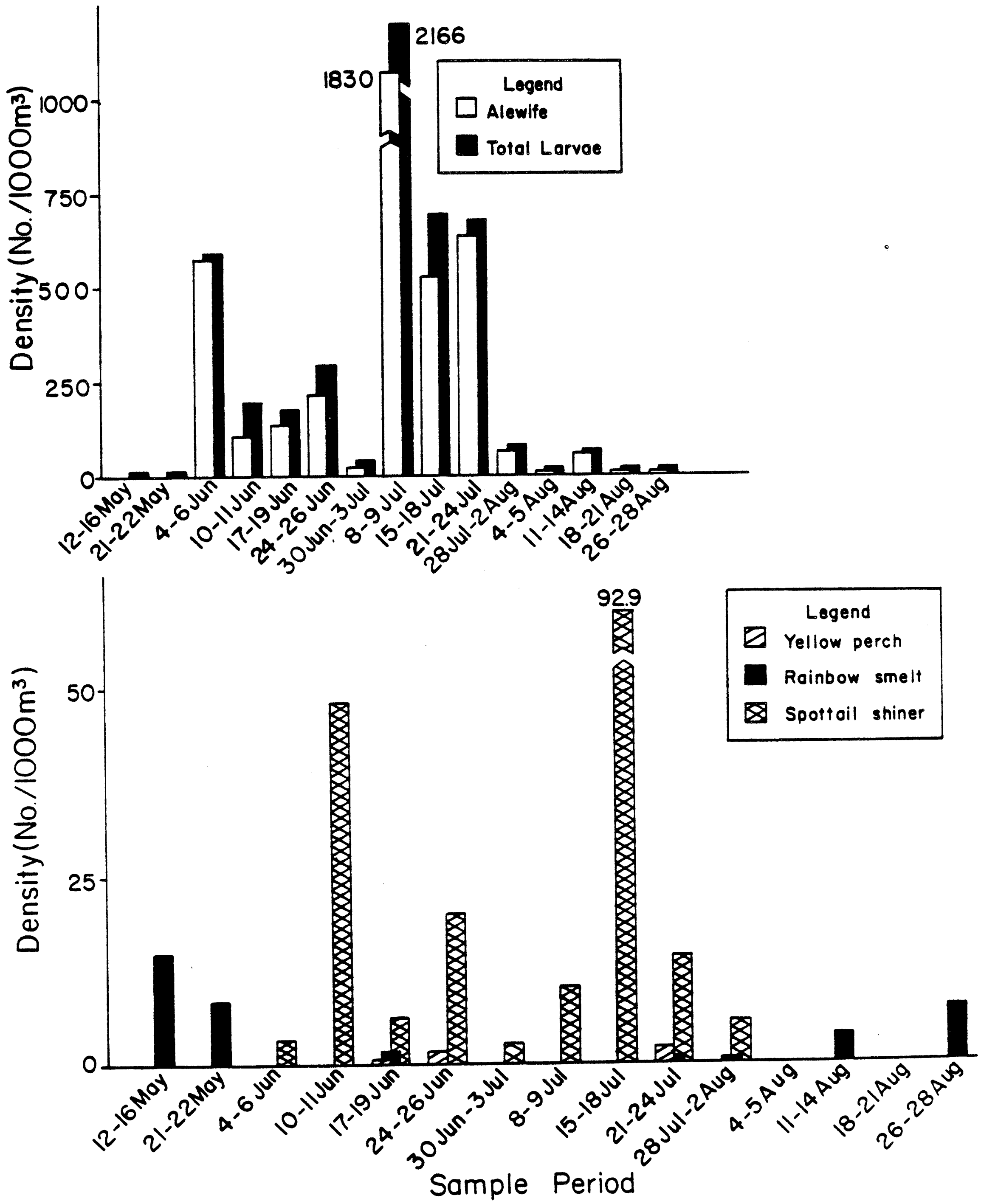

Figure 27. Density estimates of entrained fish larvae (no./1,000 m³) for alewife, spottail shiner, rainbow smelt, and yellow perch larvae, and fish eggs found in intake water used for condenser cooling at the D. C. Cook Plant, 1975.

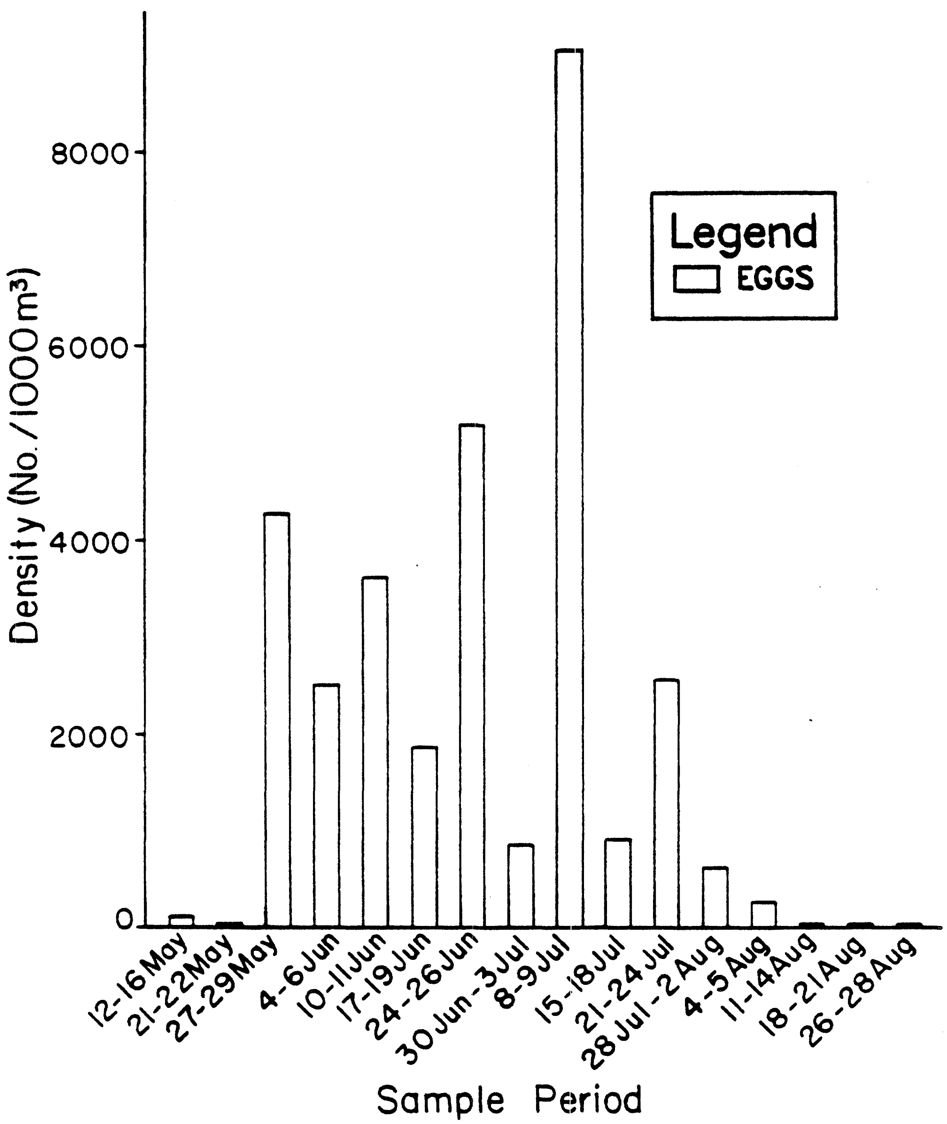

Figure 27. Continued.

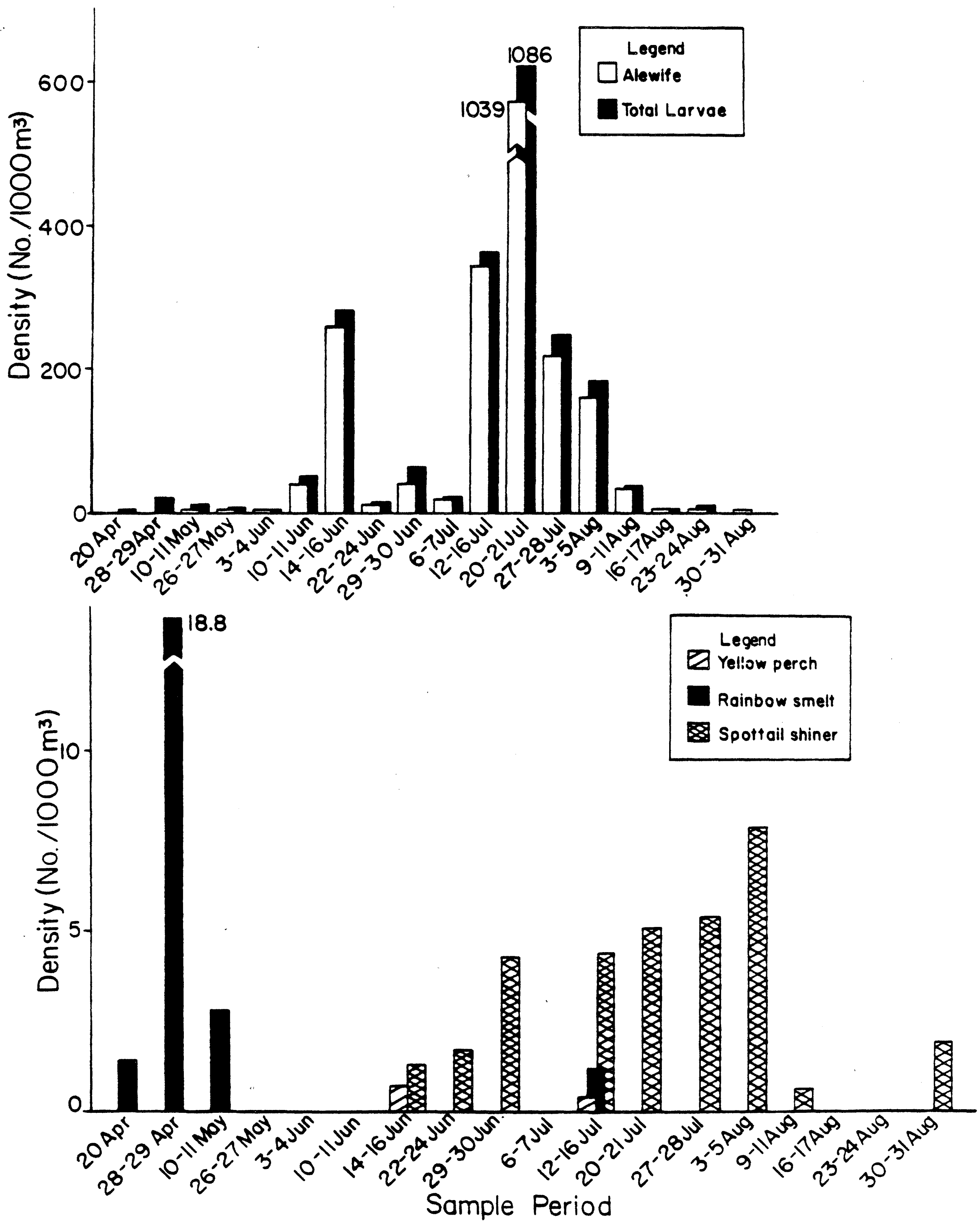

Figure 28. Density estimates of entrained fish larvae (no./1,000 m³) for alewife, spottail shiner, rainbow smelt, and yellow perch larvae, and fish eggs found in intake water used for condenser cooling at the D. C. Cook Plant, 1976.

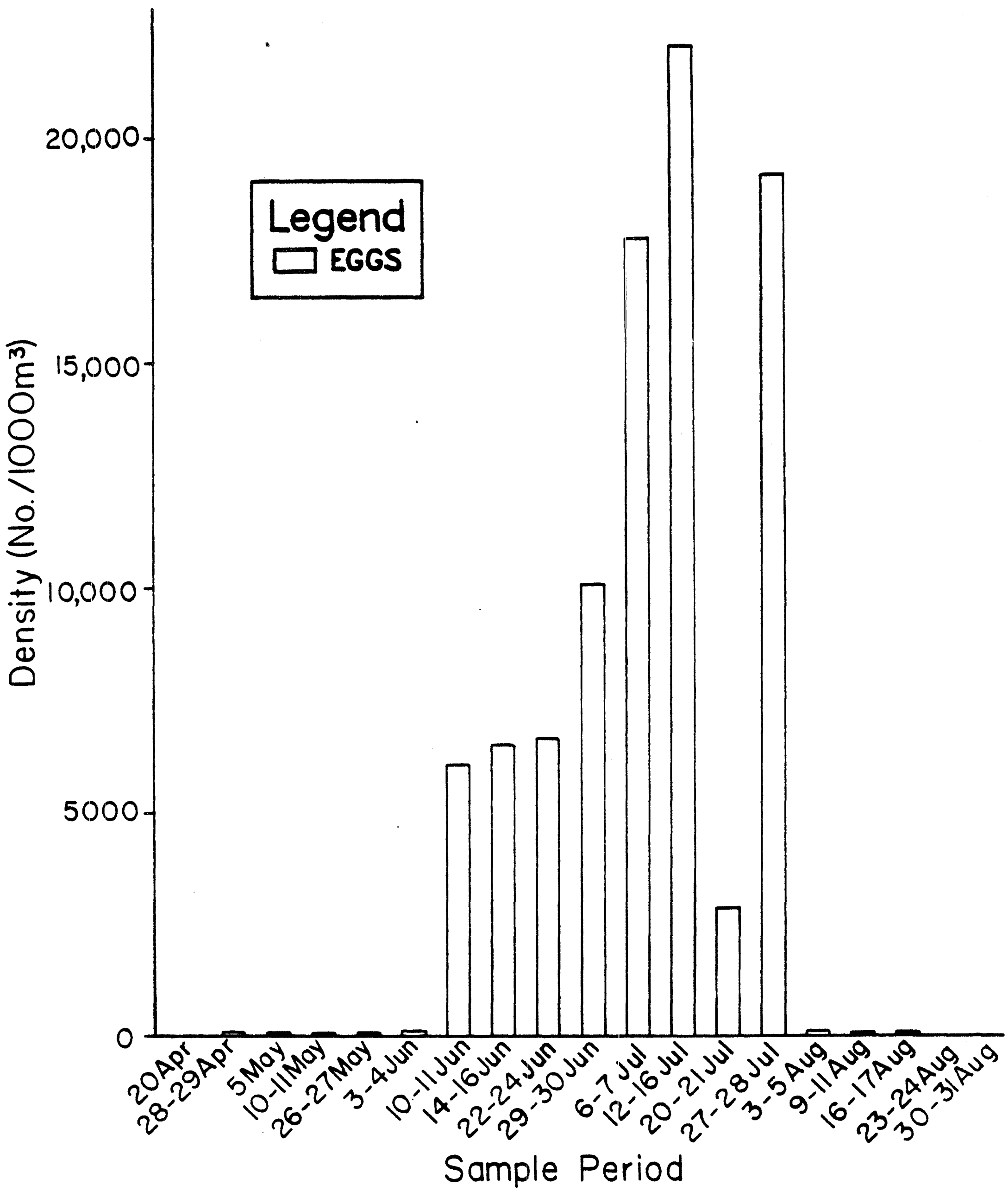

Figure 28. Continued.

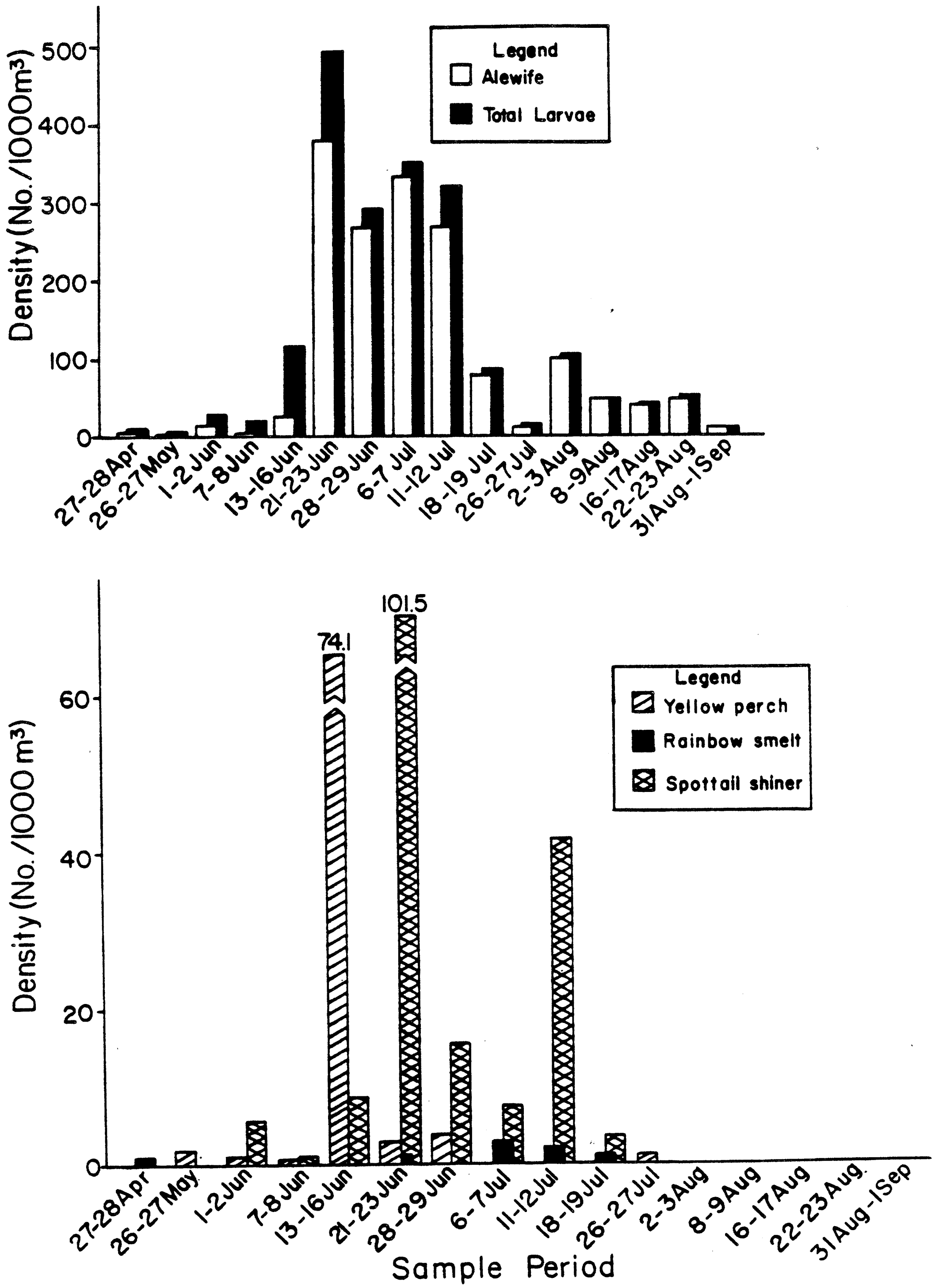

Figure 29. Density estimates of entrained fish larvae (no./1,000 m³) for alewife, spottail shiner, rainbow smelt, and yellow perch larvae, and fish eggs found in intake water used for condenser cooling at the D. C. Cook Plant, 1977.

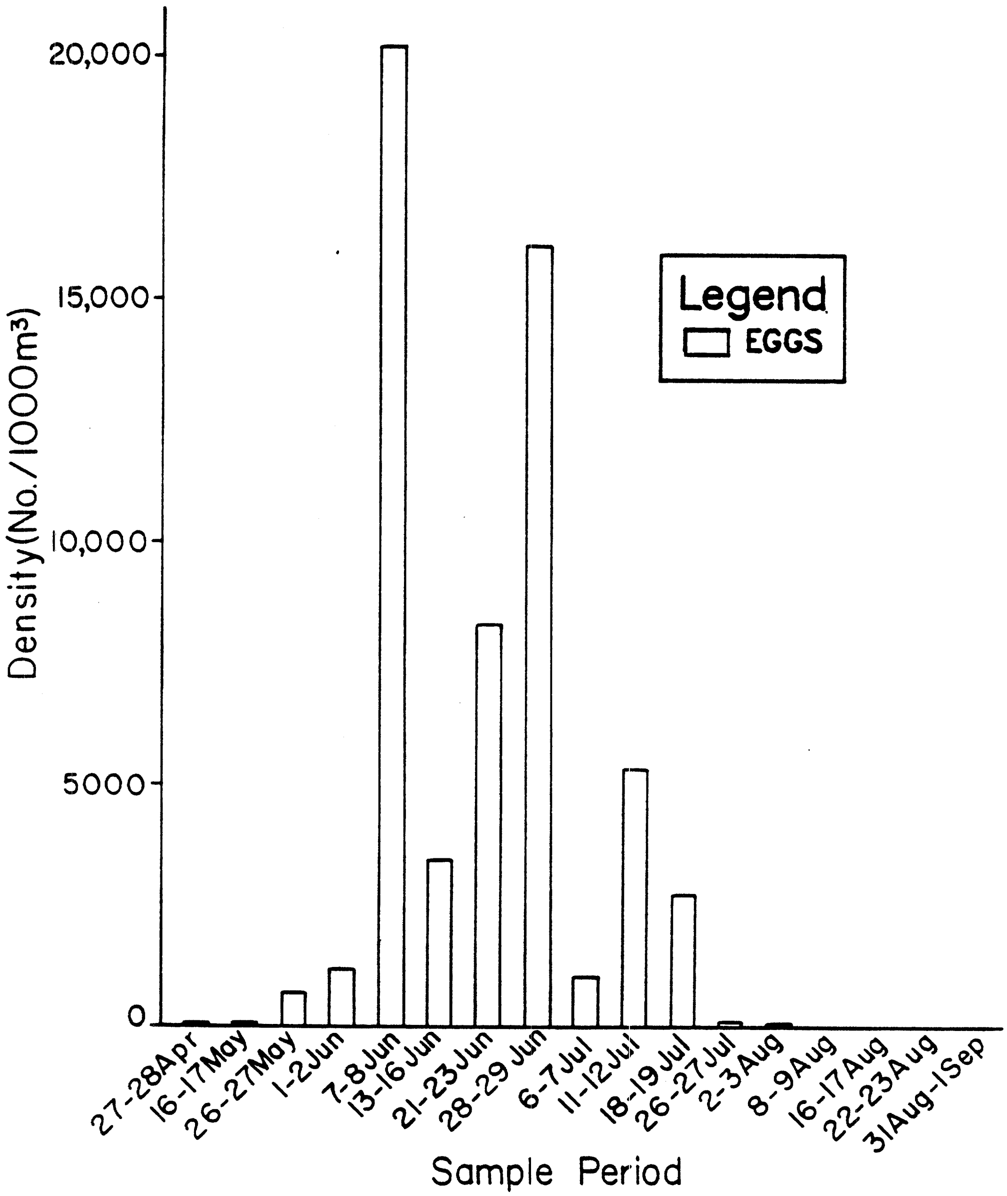

Figure 29. Continued.

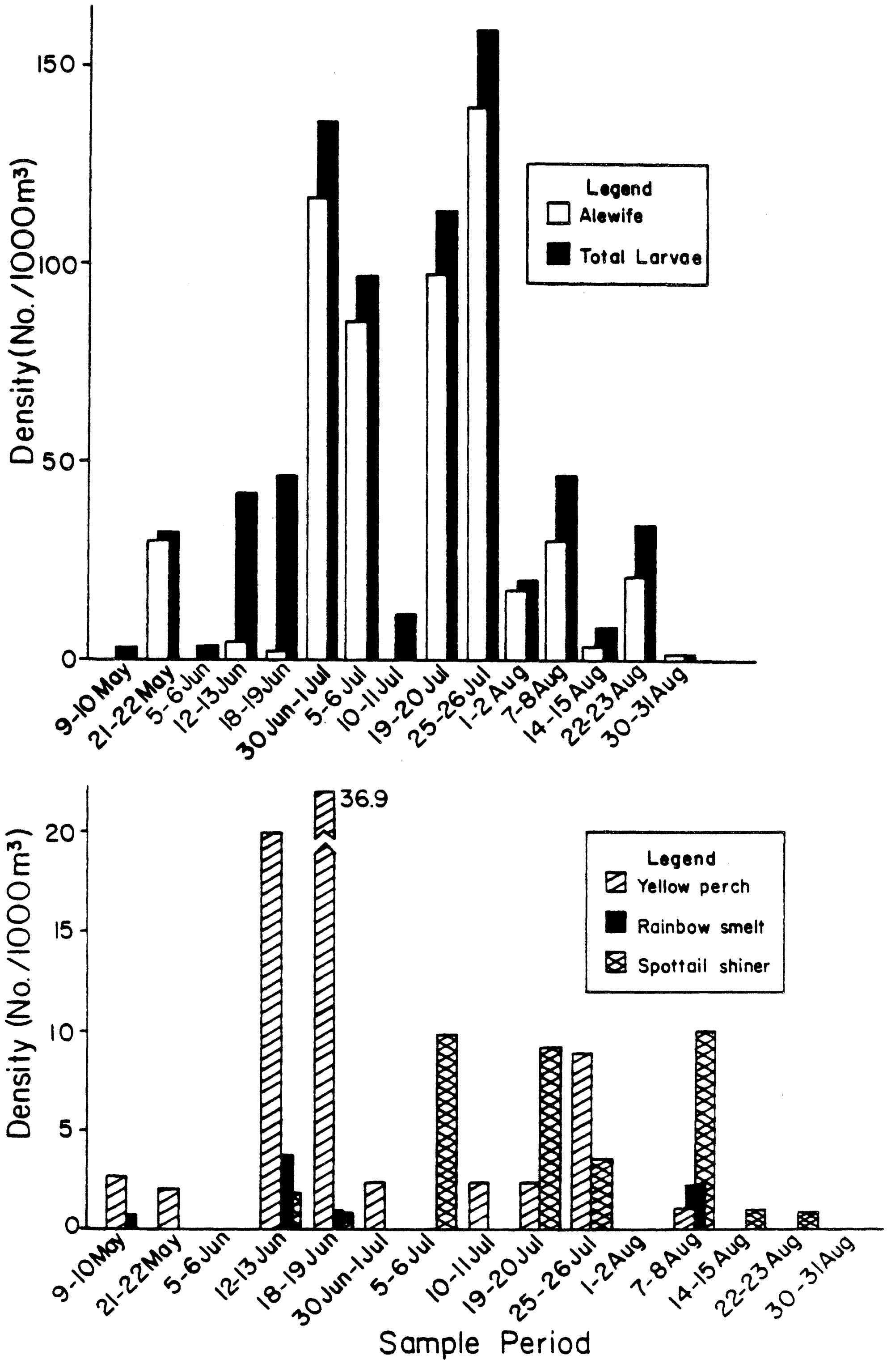

Figure 30. Density estimates of entrained fish larvae (no./1,000 m³) for alewife, spottail shiner, rainbow smelt, and yellow perch larvae, and fish eggs found in intake water used for condenser cooling at the D. C. Cook Plant, 1978.

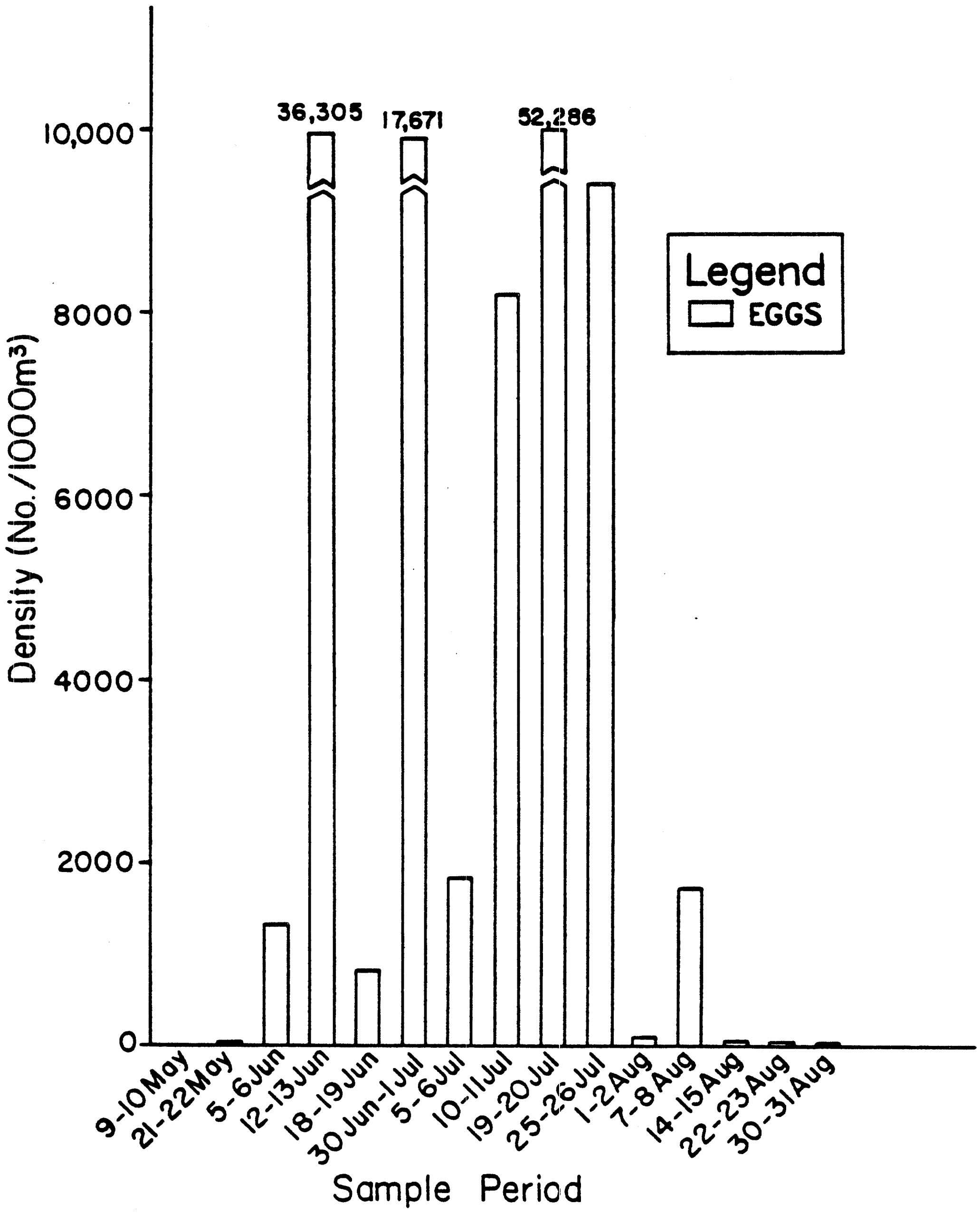

Figure 30. Continued.

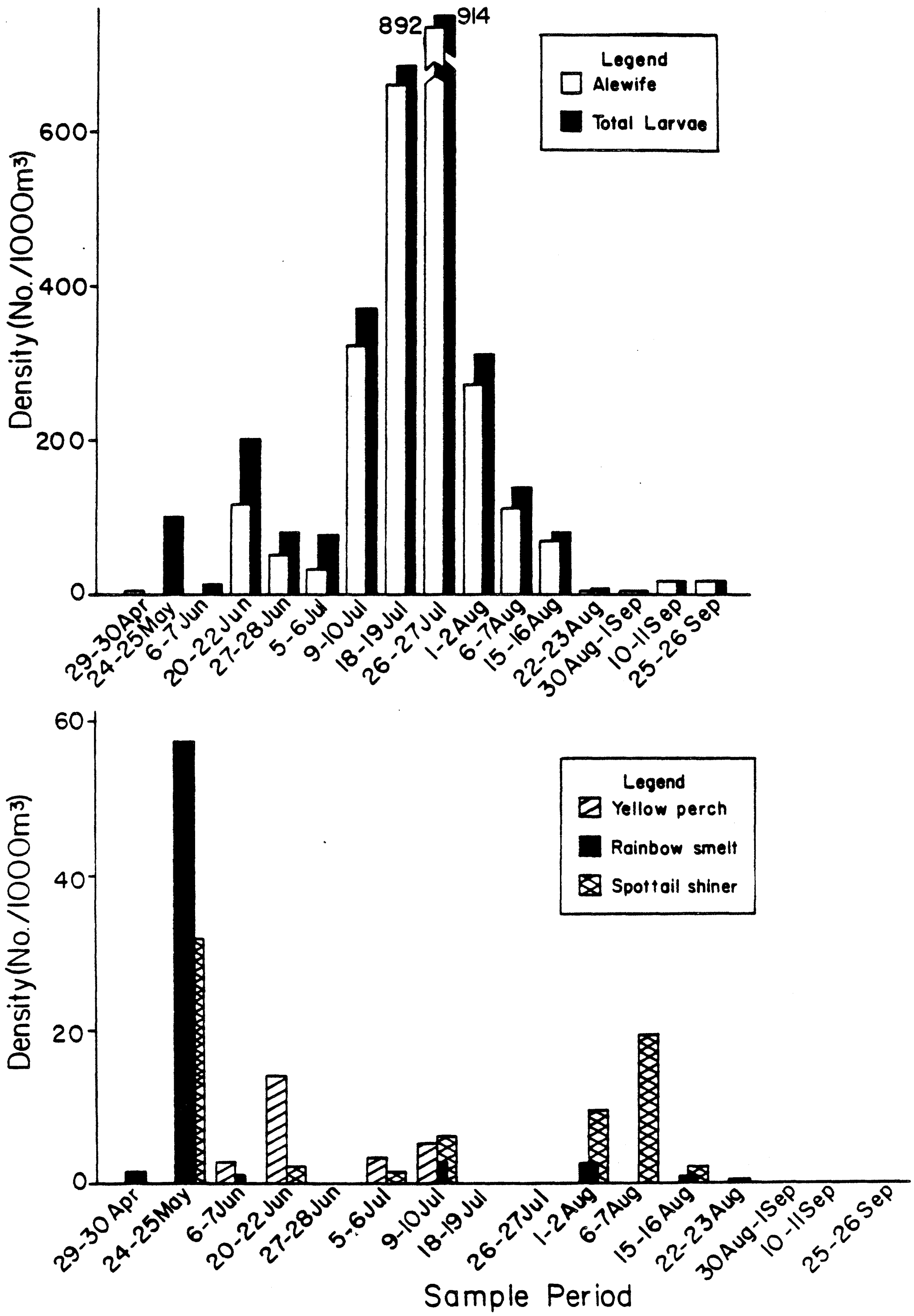

Figure 31. Density estimates of entrained fish larvae (no./1,000 m³) for alewife, spottail shiner, rainbow smelt, and yellow perch larvae, and fish eggs found in intake water used for condenser cooling at the D. C. Cook Plant, 1979.

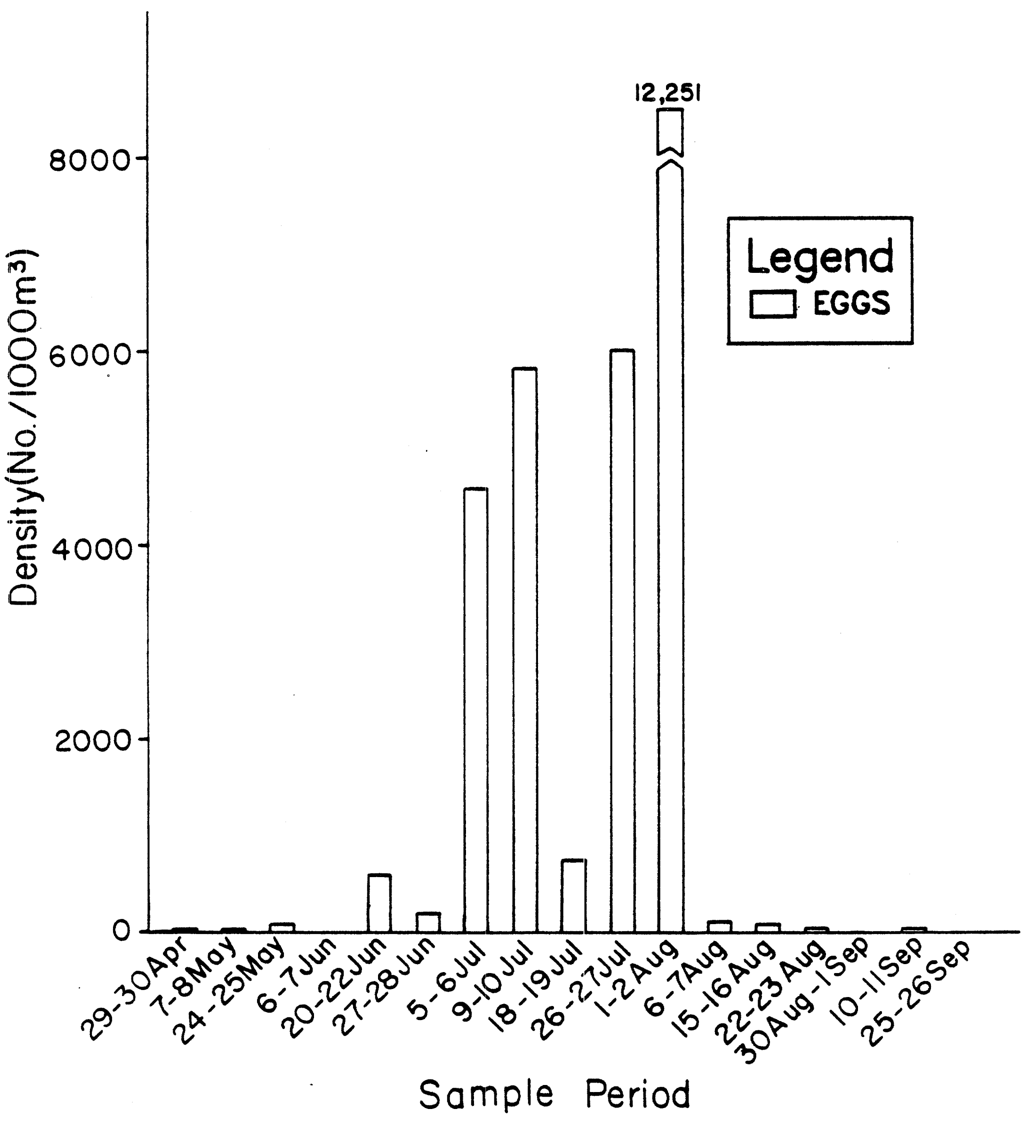

Figure 31. Continued.

Table 33. Length-frequency distribution of alewife larvae (sum of densities in no./1,000 m^3) entrained at the D. C. Cook Plant, southeastern Lake Michigan, 1975. Length intervals are in mm (e.g., the 5-mm interval includes all larvae from 4.1 to 5.0 mm TL). Blanks indicate zero densities. Sample sizes are in parentheses.

	Length interval (mm)																							
Date (N)	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
4-6 Jun (3)		2,264	1,059	124																				
10-11 Jun (6)		94	473	80																				
17-19 Jun (20)	45	590	1,441	564	70	23																		
24-26 Jun (12)	36	745	1,676	485	56																			
30 Jun-3 Jul (14)		55	137	204																				
8-9 Jul (7)	34	4,706	8,092	1,786		13															13			
15-18 Jul (10)		2,161	3,183	889	53						18													
21-24 Jul (22)	35	1,382	8,715	2,564	320	349	192	185	103					13	35		112	15						
28 Jul-2 Aug (46)		338	1,659	466	181				26	26		51	52	78			26							
4-6 Aug (14)		15	13	43															7					
11-14 Aug (13)				17		52					53	36	19	38	34	36	198	69	17	17	52	58		
18-21 Aug (14)																				7				
26-28 Aug (10)														7							10			
8-9 Sep (7)																			22					

Table 34. Length-frequency distribution of alewife larvae (sum of densities in no./1,000 m³) entrained at the D. C. Cook Plant, southeastern Lake Michigan, 1976. Length intervals are in mm (e.g., the 5-mm interval includes all larvae from 4.1 to 5.0 mm TL). Blanks indicate zero densities. Sample sizes are in parentheses.

	Length interval (mm)																							
Date (N)	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
10-11 May (16)				12	7																			
26-27 May (11)					11																			
3-4 Jun (12)			10					10																
10-11 Jun (12)		188	238	9	28																			
14-16 Jun (18)		364	2,214	1,885	207	10																		
22-23 Jun (12)		25	79	16	20																			
29-30 Jun (12)			241	213		26																		
6-7 Jul (12)			126	61							26						13							
12-16 Jul (17)		3,080	5,114	1,359	691	455	123	92	64	120	231	240	203	234	239	105	71	9	33	94	9	14	37	37
20-21 Jul (16)		689	8,703	4,181	239	268	156	66	177	203	276	430	199	323	90	103	61	146	65	187	34	31		
27-28 Jul (19)		310	1,592	621	517	453	262	107	165	47				18				55						
3-5 Aug (20)		34	49	197	41	111	150	242	328	153	322	246	305	138	178	122	93	85	78	27	47	119	96	
9-11 Aug (16)			8	21	22	8	13	49	81	86	85	69	51	75	50	79	25	8	52	7	7		21	
16-17 Aug (16)													26			15	18		15	13				
23-24 Aug (16)						19																		20
22-23 Sep (11)														14	27		13							
11-12 Oct (12)															40									

Table 35. Length-frequency distribution of alewife larvae (sum of densities in no./1,000 m³) entrained at the D. C. Cook Plant, southeastern Lake Michigan, 1977. Length intervals are in mm (e.g., the 5-mm interval includes all larvae from 4.1 to 5.0 mm TL). Blank entries indicate zero densities. Sample sizes are in parentheses.

	Length interval (mm)																							
Date (N)	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
27-28 Apr (16)				15		15																		
26-27 May (16)			24																					
1-2 Jun (16)		107	135	18																				
7-8 Jun (20)		19	38		10					11														
13-16 Jun (16)		75	397	192	35		58																	
21-23 Jun (20)		2,200	6,715	1,502	101		12	13		12		57												
28-29 Jun (16)		204	1,713	1,015	581	368		19	22		90	21	38	59	36	41	45	36						
6-7 Jul (16)		840	2,757	931	66	103	82	68	117	30	30	30	103	87	42	24								
11-12 Jul (16)		569	1,465	1,601	460	269	78	182	15	15	73	56	10			21		21				15		
18-19 Jul (16)			603	117	106	136	61		79			105	58	27										
26-27 Jul (16)				38	72	56			23	25														
2-3 Aug (16)		17	138	619	317	27	45	136			83				85		40		45					44
8-9 Aug (16)			190	59	67	51	16	32	151	16	13	13	30	99	32									16
16-17 Aug (16)			40	13	30	66	99		168	80	17	28	19	49	19		13							
22-23 Aug (16)				33	19		38	48	41	19	94	117	117	51	16	156		22						
31 Aug-1 Sep (16)											13		13	60	36	13		36						
12-13 Sep (16)															17									
27-28 Sep (16)														14			33		14			25		

Table 36. Length-frequency distribution of alewife larvae (sum of densities in no./1,000 m³) entrained at the D. C. Cook Plant, southeastern Lake Michigan, 1978. Length intervals are in mm (e.g., the 5-mm interval includes all larvae from 4.1 to 5.0 mm TL). Blank entries indicate zero densities. Sample sizes are in parentheses.

Date (N)	Length interval (mm)																							
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
21-22 May (16)			42	210	210			21																
12-13 Jun (16)	30		45																					
18-19 Jun (16)			34																					
30 Jun-1 Jul (16)		464	1,245	155																				
5-6 Jul (16)		339	780	187	64																			
19-20 Jul (16)		30	1,189	169	36						32		64	20					13					
25-26 Jul (16)		200	1,519	391	83							22			18									
1-2 Aug (16)		13		80	66	13	39			15						40		19						
7-8 Aug (15)			38			23	33	53	109	34	35	23	11			74			17					
14-15 Aug (12)			26														18							
22-23 Aug (15)								44	38						17	17		34	35	17	87	27		
29-31 Aug (16)														27										
11-12 Sep (16)																								45
25-28 Sep (20)													15	28				46	13	13	14	54	78	67
9-10 Oct (15)																28	28		68		76	91	345	372
23-24 Oct (12)																					21	21	15	
13-14 Nov (16)																			30					

Table 37. Length-frequency distribution of alewife larvae (sum of densities in no./1,000 m³) entrained at the D. C. Cook Plant, southeastern Lake Michigan, 1979. Length intervals are in mm (e.g., the 5-mm interval includes all larvae from 4.1 to 5.0 mm TL). Blanks indicate zero densities. Sample sizes are in parentheses.

Date (N)	Length interval (mm)																						
	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
20-22 Jun (25)	397	1,929	490	23	85																		
27-28 Jun (16)	212	587	42	15																			
5-6 Jul (16)		267	70	16	19	71	24	12		24		19											
9-10 Jul (16)	1,060	2,970	901	43	12	12	105	16	37				23										
18-19 Jul (12)	95	3,845	2,447	832	340	145		15	40			49		24		24			54		23		
26-27 Jul (14)		1,796	3,005	1,177	508	506	459	472	355	265	361	205	327	333	337	301	385	420	588	216	228	215	31
1-2 Aug (16)	657	1,446	172	155	155	240	296	225	29	113	164	21	98	67	68	79	84	42	21	93	68		41
6-7 Aug (11)	188	128	234	44	51	12	12	71	79		19	36	20		56			19		19	37	57	38
15-16 Aug (15)	12	82	90	99	12	60	66	41	33	10	99	75	97	19		36		137	64	64	119	95	280
22-23 Aug (16)	11	14					7			8	18		8					7		14	15		
30 Aug-1 Sep (24)														10									
10-11 Sep (14)											27				27		64		65	59			
25-26 Sep (15)																			33	63	22	103	54
8-10 Oct (13)																32		18			18		
16-17 Oct (16)		17	17													16				16	20	16	
12-13 Nov (16)																							17

entrained larvae in 1976, 1977, and 1979 in all length categories was indicated (Tables 33-37). In those years, upwellings appeared to be minor and of short duration (Figs. 22-26). In 1978; however, relatively frequent upwellings of cooler waters continued almost biweekly from early June to early August, occasionally resulting in temperature fluctuations from the upper teens (C) to less than 10°C. Mean June and July water temperatures were respectively 1.8C° and 3.8C° below their means for the period (1973-1979).

Diel distribution --

Alewife larvae were usually collected in significantly higher numbers during night sampling (Tables 24 and 38-47). Highest densities during all years usually occurred during either sunset-midnight (N2) or midnight-dawn (N1) diel periods. They were: 3,247 larvae per 1,000 m^3 (midnight-dawn) on 8-9 July 1975, 1,760 larvae per 1,000 m^3 (dusk-midnight) on 20-21 July 1976, 1,187 larvae per 1,000 m^3 (dusk-midnight) on 21-23 June 1977, 370 larvae per 1,000 m^3 (dusk-midnight) on 30 June-1 July 1978, and 1,761 larvae per 1,000 m^3 (dusk-midnight) on 26-27 July 1979. For entrainment densities, the diel factor was statistically significant (ANOVA) for total larvae densities, alewife larvae densities, and occasionally egg densities (Table 23). Density (no. per 1,000 m^3) ratios of day:night entrained alewife larvae were: 39:249 (1975), 62:109 (1976), 33:106 (1977), 11:32 (1978), and 28:136 (1979). Overall, during the entire period, 1975-1979 densities of alewife entrained at night were almost four times day values. In general, although more larvae were caught at night, their length-frequency distributions during day and night were similar (Fig. 32). Except for 1978, proportionately more yolk-sac alewife larvae were entrained during the day. Proportionately more larger larvae were entrained at night, a probable result of reduced intake avoidance.

Spottail Shiner

Seasonal abundance trends--

Approximately 10.5 million spottail shiner larvae were entrained during 1975-1979, making them the second-most commonly entrained species (Tables 25-30). Annual entrainment loss estimates ranged from 0.9 million in 1976 to 3.4 million in 1975. Although they were the second-most abundant species, spottails represented only 3.1% of the total projected entrainment loss for the period 1975-1979, probably because of their nearshore distribution away from the influence of the intakes.

Table 38. Length-frequency distributions (sum of densities in no./1,000 m³) by diel period for major species entrained at the D. C. Cook Plant, southeastern Lake Michigan, 1975. Length intervals are in mm (e.g., the 5-mm interval includes all larvae from 4.1 to 5.0 mm TL). Blanks indicate zero densities. Sample sizes: 291 (total), 67 (midnight-dawn), 80 (dawn-noon), 74 (noon-dusk), 70 (dusk-midnight).

Species/ diel period	Length interval (mm)																							
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Alewife																								
Midnight-dawn	35	5,744	11,176	2,517	217	70	76	69	41		71	36	45	38	69	36		32	17	17		17		
Dawn-noon		1,172	1,665	593	12	30								26										
Noon-dusk	58	429	1,427	451	115		11	11	13					13										
Dusk-midnight	57	1,417	8,176	2,701	237	324	105	105	49			25	26	26			336	52	22		52	41		
Spottail shiner																								
Midnight-dawn			17	432	165	20																		
Dawn-noon				52																				
Noon-dusk				96	20																			
Dusk-midnight			21	964	184			25																
Rainbow smelt																								
Midnight-dawn					47	15					17							26						
Dawn-noon			12																					
Noon-dusk		15	15	61	30														15					
Dusk-midnight																				47	45	45		
Yellow perch																								
Midnight-dawn					15																			
Dawn-noon				18																				
Noon-dusk																								
Dusk-midnight					46	23																		

Table 39. Length-frequency distributions (sum of densities in no./1,000 m³) by diel period for major species entrained at the D. C. Cook Plant, southeastern Lake Michigan, 1976. Length intervals are in mm (e.g., the 5-mm interval includes all larvae from 4.1 to 5.0 mm TL). Blanks indicate zero densities. Sample sizes: 461 (total), 114 (midnight-dawn), 117 (dawn-noon), 108 (noon-dusk), 122 (dusk-midnight).

Species/ diel period	Length interval (mm)																							
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Alewife																								
Midnight-dawn		425	3,192	1,928	372	207	142	213	270	192	257	398	192	151	45	96	70	52	49	61	43		55	36
Dawn-noon		2,665	4,412	1,257	202	83	61	30	58	77	61	113	69	51	96		55		12		16			
Noon-dusk		188	2,131	1,506	224	57	52	36	27	16	37	26	77	25	44	38	27	16	38	13				
Dusk-midnight		1,286	7,665	3,597	627	701	326	212	380	190	344	217	235	339	178	142	87	218	81	239	22	150	91	
Spottail shiner																								
Midnight-dawn			20	32		17																		
Dawn-noon				95	39																			
Noon-dusk					13																			
Dusk-midnight			98	210	139																			
Rainbow smelt																								
Midnight-dawn			52	17	35	17													15	15		15		
Dawn-noon				44	46																			
Noon-dusk			10		10	27	12																	
Dusk-midnight						7																		
Yellow perch																								
Midnight-dawn																								
Dawn-noon				14																				
Noon-dusk						13																		
Dusk-midnight																								

Table 40. Length-frequency distributions (sum of densities in no./1,000 m³) by diel period for major species entrained at the D. C. Cook Plant, southeastern Lake Michigan, 1977. Length intervals are in mm (e.g., the 5-mm interval includes all larvae from 4.1 to 5.0 mm TL). Blanks indicate zero densities. Sample sizes: 432 (total), 105 (midnight-dawn), 108 (dawn-noon), 114 (noon-dusk), 105 (dusk-midnight).

Species/ diel period	Length interval (mm)																							
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Alewife																								
Midnight-dawn		424	2,633	2,136	603	565	223	269	311	108	173	161	78	212	126	75		43				23		28
Dawn-noon		310	1,727	988	410	54	80	73	46	19	32	40		43		24								32
Noon-dusk		312	1,661	733	104	24	10	38	49	49	17	25	12	27		14	13		14					
Dusk-midnight		2,309	6,916	1,958	661	416	106	84	210	32	181	201	288	164	157	142	118	72	45					
Spottail shiner																								
Midnight-dawn			130	586	342	52			18															
Dawn-noon				54		36			21		21													
Noon-dusk		27	104	52	37	34																		
Dusk-midnight			297	1,224	572																			
Rainbow smelt																								
Midnight-dawn				16																		21		40
Dawn-noon																								
Noon-dusk								13																
Dusk-midnight																			46					
Yellow perch																								
Midnight-dawn			1,188	593	38	19	23																	
Dawn-noon				19																				
Noon-dusk				23	33	14																		
Dusk-midnight				221	99	88			18															

Table 41. Length-frequency distributions (sum of densities in no./1,000 m^3) by diel period for major species entrained at the D. C. Cook Plant, southeastern Lake Michigan, 1978. Length intervals are in mm (e.g., the 5-mm interval includes all larvae from 4.1 to 5.0 mm TL). Blanks indicate zero densities. Sample sizes: 469 (total), 116 (midnight-dawn), 116 (dawn-noon), 117 (noon-dusk), 120 (dusk-midnight).

Species/ diel period	Length interval (mm)																							
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Alewife																								
Midnight-dawn		111	545	142	37			35	17			22		20	35	45	46	53	65	17	59	61	258	93
Dawn-noon	30	112	547	105					45		24			19					68		51	30	51	68
Noon-dusk		131	542	193	78	36	72	62	22	49	11	23	26	15		11			30		14	30		28
Dusk-midnight		692	3,284	752	344			21	63		32		64	13		103		46	13	13	74	72	129	295
Spottail shiner																								
Midnight-dawn				234	18																			
Dawn-noon			20	30																				
Noon-dusk				13	13			13																
Dusk-midnight			42	159	42																			
Rainbow smelt																								
Midnight-dawn													17									17		
Dawn-noon																								
Noon-dusk			11	16																				
Dusk-midnight				60																				
Yellow perch																								
Midnight-dawn			18	105	60																			
Dawn-noon				27	13	28																		
Noon-dusk				56	73	40																		
Dusk-midnight		42	195	244	320		36																	

Table 42. Length-frequency distributions (sum of densities in no./1,000 m³) by diel period for major species entrained at the D. C. Cook Plant, southeastern Lake Michigan, 1979. Length intervals are in mm (e.g., the 5-mm interval includes all larvae from 4.1 to 5.0 mm TL). Blanks indicate zero densities. Sample sizes: 458 (total), 113 (midnight-dawn), 114 (dawn-noon), 116 (noon-dusk), 115 (dusk-midnight).

Species/ diel period	Length interval (mm)																							
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Alewife																								
Midnight-dawn		771	4,239	3,753	1,118	632	671	480	412	333	156	324	295	165	183	289	293	244	330	247	185	231	274	208
Dawn-noon		324	1,257	586	370	78	19	20	36	55		45	19	20						42		20		
Noon-dusk		337	1,747	787	137	86	145	50	76	56				14		25	42	15	18		12	43	12	24
Dusk-midnight	113	1,189	5,824	2,330	779	386	211	412	318	129	246	305	91	366	260	174	141	274	263	499	323	192	176	106
Spottail shiner																								
Midnight-dawn			41	264				22								20								
Dawn-noon				14																				
Noon-dusk			13	123	58																			
Dusk-midnight			37	184			103			37														
Rainbow smelt																								
Midnight-dawn				27	27		27		54												21			41
Dawn-noon				23	42	42			16															
Noon-dusk				134	17																			
Dusk-midnight					167	47		47																
Yellow perch																								
Midnight-dawn				12	23	12																		
Dawn-noon					19																			
Noon-dusk				13	39	13																		
Dusk-midnight				35	279	60				23														

Table 43. Mean densities (no./1,000 m³) of fish larvae and fish eggs entrained at the D. C. Cook Plant, southeastern Lake Michigan, 1975. Data are summarized over diel periods: N1 (midnight-dawn), D1 (dawn-noon), D2 (noon-dusk), N2 (dusk-midnight). Blanks indicate zero densities. See Tables 33-42 and Appendix 1 for sample sizes.

Date	Alewife				Spottail shiner				Rainbow smelt				Yellow perch				Total larvae				Fish eggs			
	N1	D1	D2	N2	N1	D1	D2	N2	N1	D1	D2	N2	N1	D1	D2	N2	N1	D1	D2	N2	N1	D1	D2	N2
22-23 Feb																					19		22	10
15-16 Apr																					8			10
22-23 Apr														9				9			16	8	27	9
12-16 May									46		53						46		68		15	20	491	67
21-22 May											6							6						
27-29 May																						1295		
4-6 Jun		237	280				20											244	350			1429	522	
10-11 Jun	219	63	42		138		7										430	90	61		7143	2025	1708	
17-19 Jun	245	97	154	73	4	4	5	11	4		3		4				286	125	186	134	4355	1069	549	2074
24-26 Jun	97	7	115	148	10		14	51								12	107	43	151	378	5850	1924	1105	1692
30 Jun-3 Jul		48	8	42		9												80	8	53	508	2153	445	273
8-9 Jul	4800	62	70	2306	9			20									4808	770	84	2910	13313	2122		18510
15-18 Jul	200	92		592	45			181									286	115		898	1602	225		831
21-24 Jul	1253	250	81	779	22			31	3							8	1326	259	91	835	7522	468	32	1397
28 Jul-2 Aug	62	58	43	98				10	3								88	58	43	127	466	88	130	267
4-6 Aug		5	14															5	19			10	64	
11-14 Aug	75			99								12					75			111				13
18-21 Aug																							6	20
26-28 Aug											4	45							4	45				
2-3 Sep																					6			
8-9 Sep				22															6	44				
22-23 Oct																	8							

Table 44. Mean densities (no./1,000 m³) of fish larvae and fish eggs entrained at the D. C. Cook Plant, southeastern Lake Michigan, 1976. Data are summarized over diel periods: N1 (midnight-dawn), D1 (dawn-noon), D2 (noon-dusk), N2 (dusk-midnight). Blanks indicate zero densities. See Tables 33-42 and Appendix 2 for sample sizes.

	Alewife				Spottail shiner				Rainbow smelt				Yellow perch				Total larvae				Fish eggs			
Date	N1	D1	D2	N2	N1	D1	D2	N2	N1	D1	D2	N2	N1	D1	D2	N2	N1	D1	D2	N2	N1	D1	D2	N2
27-28 Jan																							17	237
10-11 Feb																				5	68	50	20	119
25-26 Feb																						16		
9-10 Mar																								7
23-24 Mar																				7	4	5		
28-29 Apr									40		5	30					40	6	5	30	5			29
10-11 May		3	2								11							9	15		4	23	72	17
26-27 May			6																11		7	10	9	
3-4 Jun		3	3															3	3		146	60	104	50
10-11 Jun	48	44	37	25													55	44	37	69	8171	4602	3439	8150
14-16 Jun	73	321	75	385		2		2							4		83	327	79	433	9666	5486	1884	8263
22-23 Jun		3	10	33				7										8	10	40	3642	3342	649	18980
29-30 Jun	41	12	9	97				17									58	20	9	168	27862	1253	514	10475
6-7 Jul	9	20	23	23													9	20	23	31	21393	8286	1129	40052
12-16 Jul	163	742	158	902		14		12	15					2			310	764	162	914	7176	52932	830	14422
20-21 Jul	1292	350	755	1760				20									1323	350	861	1813	6366	1576	830	2684
27-28 Jul	274	74	52	325	5			11									288	74	60	376	59406	10744	3357	9218
3-5 Aug	125	22	48	355	3			23									134	22	48	423	259	21	5	56
9-11 Aug	75	17	22		4												78	17	22	11	246	98	9	12
16-17 Aug	17	5															17	5			18			
23-24 Aug	10																10			5				
30-31 Aug					4		3										4		3					
22-23 Sep	9	14				13											13	26						
11-12 Oct		10						6										10		6				
29 Nov-2 Dec																				2			2	

Table 45. Mean densities (no./1,000 m^3) of fish larvae and fish eggs entrained at the D. C. Cook Plant, southeastern Lake Michigan, 1977. Data are summarized over diel periods: N1 (midnight-dawn), D1 (dawn-noon), D2 (noon-dusk), N2 (dusk-midnight). Blanks indicate zero densities. See Tables 33-42 and Appendix 3 for sample sizes.

Date	Alewife				Spottail shiner				Rainbow smelt				Yellow perch				Total larvae				Fish eggs			
	N1	D1	D2	N2	N1	D1	D2	N2	N1	D1	D2	N2	N1	D1	D2	N2	N1	D1	D2	N2	N1	D1	D2	N2
11-12 Apr																		5					4	10
27-28 Apr	8								4								12	16			164	185		
16-19 May																							3	
26-27 May		6														9		6	3	9	387	134	431	1841
1-2 Jun	5	34	27		14	10								5			32	52	27	10	819	2065	1603	306
7-8 Jun			3												2	3	9		14	55	1484	4944	19577	1575
13-16 Jun	11	57	20	39	5		7	45					450		11	76	471	73	38	173	7980	1700	1342	6288
21-23 Jun	383	284	147	1187	72		11	436			2				2	17	460	284	166	1660	7599	5044	878	23144
28-29 Jun	156	109	92	716	5	24	34						15				191	133	125	716	50033	6057	778	7503
6-7 Jul	459	156	124	588	16			15				12					490	162	124	626	1478	381	410	2031
11-12 Jul	569	157	33	401	171			14	11								765	157	37	429	10176	2231	426	3324
18-19 Jul	82	12	86	143				15									87	18	86	157	4611	1042	3396	1995
26-27 Jul	26	12	12	4					5							5	31	12	12	12	195	37	24	88
2-3 Aug	76	69	29	225													79	77	29	235	65	63	4	10
8-9 Aug	138	26		33													138	26		33				
16-17 Aug	59	23	30	48													59	23	34	48				
22-23 Aug	57	25	16	95													57	25	16	106				
31 Aug-1 Sep	13			30													13			30				
12-13 Sep	4																8							
27-28 Sep	6		7	8													6		7	8				

Table 46. Mean densities (no./1,000 m³) of fish larvae and fish eggs entrained at the D. C. Cook Plant, southeastern Lake Michigan, 1978. Data are summarized over diel periods: N1 (midnight-dawn), D1 (dawn-noon), D2 (noon-dusk), N2 (dusk-midnight). Blanks indicate zero densities. See Tables 33-42 and Appendix 4 for sample sizes.

	Alewife				Spottail shiner				Rainbow smelt				Yellow perch				Total larvae				Fish eggs			
Date	N1	D1	D2	N2	N1	D1	D2	N2	N1	D1	D2	N2	N1	D1	D2	N2	N1	D1	D2	N2	N1	D1	D2	N2
10-11 Jan																					5355			
24-25 Jan																					3	37	25	
6-7 Feb																								3
29-30 Mar																		5	3					
9-10 May											3		4	7			4	7	3					
21-22 May				121												9				129	31			
5-6 Jun																		7		8	276	5841	261	103
12-13 Jun		8		11		8						15	5		4	71	8	28	7	125	64954	20461	10197	49608
18-19 Jun	5		3				3				4		33	10	39	66	38	27	56	66	534	909	1541	398
30 Jun-1 Jul	81		15	370												10	114		15	414	45313	7825	2048	15498
5-6 Jul	43	78	34	188	14	5		21									57	83	38	208	3820	1365	287	1965
10-11 Jul																12	34			12	7155	4174	4177	20391
19-20 Jul	15	19	3	352	6			32								10	20	27	3	402	92370	12156	2530	102090
25-26 Jul	80	85	138	256	6			9								36	86	85	138	329	25496	4326	1690	6089
1-2 Aug	5		57	10									4				5		57	19	105	83	153	128
7-8 Aug	9	22	51	42	38				9								71	22	51	42	4455	1918	153	
14-15 Aug	6		9				4										6		17	11	215	29	27	
22-23 Aug	47	7	7	20			3										69	7	14	40	22		4	
29-31 Aug		5																5						
11-12 Sep				11																11				
25-28 Sep	8		26	25													15	7	26	25	4			1
9-10 Oct	116	67		92													125	80		92	3			
23-24 Oct				19																19				
13-14 Nov	3		4														3		4					

Table 47. Mean densities (no./1,000 m³) of fish larvae and fish eggs entrained at the D. C. Cook Plant, southeastern Lake Michigan, 1979. Data are summarized over diel periods: N1 (midnight-dawn), D1 (dawn-noon), D2 (noon-dusk), N2 (dusk-midnight). Blanks indicate zero densities. See Tables 33-42 and Appendix 5 for sample sizes.

	Alewife				Spottail shiner				Rainbow smelt				Yellow perch				Total larvae				Fish eggs			
Date	N1	D1	D2	N2	N1	D1	D2	N2	N1	D1	D2	N2	N1	D1	D2	N2	N1	D1	D2	N2	N1	D1	D2	N2
25-26 Jan																					69	136	98	54
12-13 Feb																							9	
22-23 Mar																					10			10
9-10 Apr																					3			15
29-30 Apr										6								10			5			
7-8 May																					8	6	26	
24-25 May					21		31	61	68	42	38	87					123	42	73	164	190	51	109	27
6-7 Jun										5						12	7	10	4	34				
20-22 Jun	92	61	67	225			10								9	43	117	96	195	376	411	99	659	1095
27-28 Jun	24	77	51	63													60	85	57	121	162	142	315	166
5-6 Jul	43	49	30	9	6								6	5	3		104	66	37	104	15051	931	442	1910
9-10 Jul	279	93	53	870	24							11	6			15	391	93	53	945	18056	1764	634	2865
18-19 Jul	1573	117	366	587													1590	133	380	636	1976	67	45	913
26-27 Jul	1492	210	134	1761													1523	210	155	1798	17412	729	264	3612
1-2 Aug	507	97	119	361	32	4	3		11								597	104	132	409	42854	4157	204	1788
6-7 Aug	103	10	116	185	12			59									143	10	116	244	83	10		288
15-16 Aug	123	11	75	140	5				5								152	14	84	149	272	93	37	22
22-23 Aug	4	5															4	5		5				
30 Aug-1 Sep																			2					
10-11 Sep	13	13	4	35													13	13	4	35	5	6		
25-26 Sep	35			45													35			45				
8-10 Oct	5		18														5		18					6
16-17 Oct	22			4													22			14				
12-13 Nov				4																4				

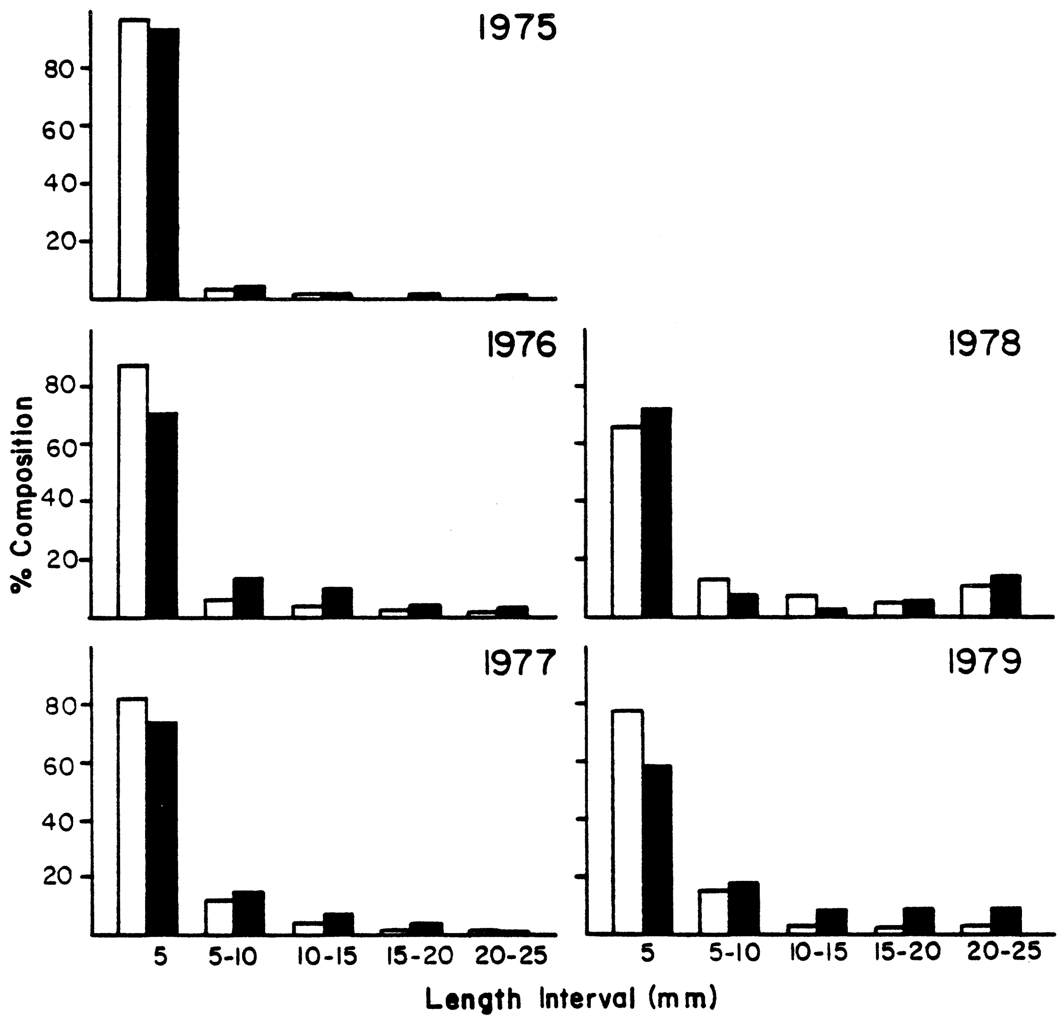

Figure 32. Length-frequency distributions for entrained alewife larvae by diel period at the D. C. Cook Plant, 1975-1979. Data are sum of densities (no. per 1,000 m³) converted to % composition. ▭ day. ■ night.

Spottail shiner larvae first appeared in entrainment samples in early to mid-June (all years) and were present until late July (1977), August (1975, 1978, 1979), or even October (1976). Peak abundance of entrained spottails generally occurred in July (1975, 1976, 1978) but occurred as early as June (1977) and as late as August (1979). Greatest 24-h mean densities for 1975-1979 were: 90.2 larvae per 1,000 m^3 (15-18 July), 8.0 larvae per 1,000 m^3 (12-16 July), 106 larvae per 1,000 m^3 (21-23 June), 10.1 larvae per 1,000 m^3 (7-8 August), and 9.6 larvae per 1,000 m^3 (1-2 August), respectively. Greatest individual sample densities in each year were: 354 larvae per 1,000 m^3 (16 July 1975), 81 larvae per 1,000 m^3 (4 August 1976), 511 larvae per 1,000 m^3 (21 June 1977), 126 larvae per 1,000 m^3 (19 July 1978), and 111 larvae per 1,000 m^3 (6 August 1979).

Larval spottails in the 3- to 12-mm interval were collected in entrainment samples, but the larger larvae were relatively rare. The majority (73%) were < 5 mm and therefore recently hatched. Most probably drifted from inshore nurseries or were the result of spawning activity on the intake riprap. Spottail shiners were more commonly entrained at night than during the day in all years. Annual percentages of spottail larvae that were entrained during darkness were: 90, 78, 90, 84, and 82 for the years 1975-1979 respectively.

Rainbow Smelt

Seasonal abundance trends--

From 1975 to 1979, rainbow smelt accounted for 0.8% (2.7 million larvae) of total entrainment estimates (Tables 25-30). Yearly estimates ranged from 0.18 million smelt larvae in 1977 to 1.4 million in 1975. Rainbow smelt larvae were first entrained in April (1976, 1977, 1979), or May (1975, 1978) as water temperature approached 9-10°C and continued to be present in samples until July (1976, 1977) or August (1975, 1978, 1979).

Time of peak abundance of smelt larvae ranged from late April (1976) to early July (1977, 1979). The greatest mean densities over a 24-h period in each year were: 30/1,000 m^3 (12-16 May, 1975), 18.8 larvae per 1,000 m^3 (28-29 April, 1976), 2.9 larvae per 1,000 m^3 (6-7 July, 1977), 3.8 larvae per 1,000 m^3 (12-13 June, 1978), and 2.8 larvae per 1,000 m^3 (9-10 July, 1979). Greatest individual sample densities for the years 1975-1979 were 105 larvae per 1,000 m^3 (12 May), 121 larvae per 1,000 m^3 (29 April), 46 larvae per 1,000 m^3 (6 July), 60 larvae per 1,000 m^3 (12 June), and 45 larvae per 1,000 m^3 (9 July), respectively.

Like many other species of fish, smelt are most susceptible to entrainment soon after hatching (Auer 1982). Peak catches in 1975, 1976, and 1978 were composed entirely of recently hatched larvae (3-7-mm length interval). In 1977 and 1979 however, our sampling dates apparently did not correspond with peak hatching for smelt. As a result, abundance peaks were smaller, occurred later, and were made up of much larger fish. Smelt larvae ≥ 19 mm represented 79% of all smelt entrained in 1977 and 73% in 1979. In 1975, 1976, and 1978 larvae ≥ 20 mm accounted for only 39%, 14%, and 14%, respectively, of the total number of smelt entrained.

Newly hatched smelt larvae (≤ 6.0 mm) (Auer 1982) were found in entrainment samples over a 1-2-wk period in 1976, 1977, and 1979 and over a 4-6-wk period in 1975 and 1978. Hatchling rainbow smelt larvae were not present after the third week of June in any year, contrary to findings at the Campbell Plant (105 km north of the Cook Plant), where a second cohort, presumably spawned offshore, was recorded in samples collected in June and July (Tin and Jude 1983).

Yellow Perch

Seasonal abundance trends--

Yellow perch were the third-most abundant larval fish entrained during 1975-1979 (5 million larvae). Yearly estimated entrainment losses for yellow perch were greatest in 1977 and 1978, 1.3 million and 3.1 million larvae, respectively. Annual estimated losses for 1975, 1976, and 1979 were each less than 0.5 million (Tables 25-30).

Perch larvae were first entrained in April (1975), May (1977, 1978), or June (1976, 1979) and continued to be collected until July (1975-1977, 1979) or early August (1978). Peak abundance generally occurred in June (1977-1979) but was as early as April (1975) and as late as July (1976). Greatest mean 24-h densities in each year were: 2.2 larvae per 1,000 m^3 (22-23 April 1975), 0.8 larvae per 1,000 m^3 (12-16 July 1976), 134.2 larvae per 1,000 m^3 (13-16 June 1977), 36.9 larvae per 1,000 m^3 (18-19 June 1978), and 14.2 larvae per 1,000 m^3 (20-22 June 1979). Greatest individual sample densities 1975-1979 were: 46 larvae per 1,000 m^3 (13 June), 225 larvae per 1,000 m^3 (12 June), and 182 larvae per 1,000 m^3 (21 June) respectively.

Although larval perch collected in entrainment samples during 1975-1979 ranged in length from 3 to 11 mm, the vast majority (98%) were newly hatched (≤ 7 mm TL). Elevated susceptibility to entrainment for hatchlings, compared with

older, larger larvae, occurs for many fish species because newly hatched larvae are generally frail and planktonic (Houde 1969). Decline in entrainment rates as larvae attain greater size is likely the result of a combination of factors including increased avoidance capabilities, a possible shift in distribution away from the intakes, and natural mortality.

More perch larvae were entrained at night than during the day in all years, except for 1976. Perch larvae ability to avoid the intakes during the day and suspected increased nighttime activity probably contributed to this phenomenon. In 1975, 1978, and 1979 greatest annual mean densities occurred during dusk-midnight sampling. Midnight-dawn samples showed greatest annual mean densities of yellow perch larvae in 1977. In 1976, the years of lowest total projected entrainment for yellow perch, no perch larvae were entrained at night. Only 3 of the 14 months during 1975-1979 in which perch were entrained showed greatest mean densities occurring during daylight hours. Of those months when greatest densities occurred during night sampling, 82% showed greatest densities in the dusk-midnight sample period.

Less Abundant Species

Johnny darters--

An estimated 2.5 million johnny darter larvae were entrained during 1975-1979, accounting for 0.7% of the total projected entrainment loss (Tables 25-30). Months of capture and numbers of samples in which johnny darters were found were: August 1975 (1 sample), July 1976 (3 samples), June-July 1977 (20 samples), July-August 1978 (7 samples), and June-August 1979 (12 samples).

Greatest individual sample densities for each year were: 15 larvae per 1,000 m^3 (5 August 1975), 184 larvae per 1,000 m^3 (12 July 1976), 96 larvae per 1,000 m^3 (7 June 1977), 73 larvae per 1,000 m^3 (1 July 1978), and 148 larvae per 1,000 m^3 (21 June 1979). Johnny darter larvae were most common during the month in which they first appeared. Johnny darters collected in entrainment samples ranged in length from 4.0 to 14.5 mm.

Trout-perch--

Like johnny darters, trout-perch have been entrained during all years (1975-1979), but in low numbers (Tables 25-30). Total trout-perch entrainment loss for the period 1975-1979 was 2.1 million larvae. Trout-perch larvae were first entrained in mid-June (1975, 1977, 1979), July (1976), or as late as August (1978), and were often present well into the fall: September

(1977), October (1975, 1979), or November (1976). Entrained trout-perch ranged in length from 4.5 to 19.3 mm. The number of entrainment samples in which trout-perch were present for each year (1975-1979) was 6, 6, 4, 1, and 8, respectively. Greatest individual sample densities were: 46 larvae per 1,000 m^3 (22 October 1975), 17 larvae per 1,000 m^3 (27 July 1976), 42 larvae per 1,000 m^3 (22 August 1977), 35 larvae per 1,000 m^3 (1 August 1978), and 75 larvae per 1,000 m^3 (27 June 1979). Trout-perch larvae were most frequently collected during night sampling. Only 3 of the 25 samples that contained trout-perch were collected during daytime.

Common carp--

Common carp were entrained from 1976 to 1979 with an estimated total entrainment loss of 0.6 million larvae (Tables 25-30). During 1976-1979, carp larvae were found in 12 samples: 3 in 1976, 1 in 1977, 2 in 1978, and 6 in 1979. The earliest record of a common carp larva in entrainment was 6 June 1979 and the latest was 15 August 1978. Entrained carp ranged in length from 4.1 to 7.0 mm and therefore were believed to have been recently hatched. Few juveniles were ever collected, suggesting high mortality of these larvae.

Unidentified minnows--

Unidentified minnows were entrained during 1977 and 1979, contributing 0.3% of the total estimated entrainment loss (Tables 25-30). In 1977, one minnow larva was collected on 12 April. In 1979, eight samples contained these larvae; the earliest occurrence was on 21 June and the latest on 7 August. Unidentified minnows ranged in length from 4.0 to 8.0 mm.

Sculpins--

Sculpins (slimy, mottled, deepwater, and unidentified) have been entrained consistently at the Cook Plant since 1975 (Tables 25-30). One-half million mottled, 0.4 million slimy, 0.2 million deepwater, and 0.6 million unidentified sculpins were entrained from 1975 to 1979 and together, they comprised less than 0.5% of total entrainment losses over that period. Slimy sculpins were present in all years but 1979, mottled sculpins in all years but 1978, and deepwater sculpins were present in 1978 and 1979.

Mottled sculpins were collected over a 1-2-wk period during June in all years that they were entrained. The earliest record of a mottled sculpin larva in entrainment samples was 2 June 1977 and the latest was 28 June 1979. Mottled sculpin larvae ranged in length from 6.0 to 9.2 mm.

Slimy sculpins were entrained predominately during June, with the exception of one larva collected in late May 1977 and one collected in mid-July 1976. The one sculpin larva collected in July was 18.0 mm TL and all others collected in May and June varied in length from 8.0 to 9.5 mm.

Slimy sculpins and mottled sculpins are very similar in appearance as larvae, and an accurate fin-ray count is essential to separate the two species correctly. Unidentified sculpins were either slimy or mottled, but due either to their deteriorated physical condition or extremely early stage of development, they could not be identified with certainty. Deepwater sculpins were easily separated from either slimy or mottled, and therefore they were not included in the unidentified sculpin category.

Unidentified sculpins were entrained in all years (1975-1979) with a total loss of 0.6 million larvae. Nearly all unidentified sculpin larvae were entrained during June, with the exception of three larvae taken in May 1976 and one in July 1975. Unidentified sculpin larvae ranged in length from 5 to 10 mm.

Only two deepwater sculpin larvae were collected in entrainment samples during 1975-1979, one on 30 March 1978 (12.8-mm TL) and one on 7 June 1979 (7.0-mm TL).

Miscellaneous--

Several other fish species were entrained at the Cook Plant on isolated occasions. One quillback larva (9.1 mm) and one coregonid larva (8.5 mm) were collected on 28 April 1977 (Tables 25-30). One unidentified darter larva (5.0 mm) was collected on 22 June 1977 as well as one ninespine stickleback (8.5 mm) on 26 September 1978. Two burbot larvae were found in entrainment samples: one on 29 April 1976 (5.5 mm) and one on 29 March 1978 (4.3 mm).

PRODUCTION FOREGONE

Production foregone is an estimate of future biomass lost through the cropping of fish populations near the Cook Plant via entrainment of larvae and impingement of juvenile and adult fish. Production foregone estimates include not only the biomass of those individuals actually destroyed by power plant operation, but also the potential contribution of those individuals during future time intervals. Production foregone is a measure of the biomass that would have been available to the ecosystem had not the loss occurred.

Production foregone has been previously examined for Cook Plant data by Rago (1979, 1983). We will briefly summarize his methods and results. For additional detail concerning Cook Plant production foregone model assumptions, descriptions, and statistical interpretation consult Rago (1979, 1980, 1983). Basic procedures used in the production foregone estimation included:

1. Transformation of length-frequency histograms of impinged fish into age frequencies using an age-length key.

2. Estimation of the frequency of pro- and postlarvae based upon a critical length at which the larva transforms from prolarva to postlarva. This stage is directly related to yolk-sac absorption.

3. Estimation of the mean weight of fish in an age class by considering the length-weight relationship and distribution of lengths within an age class.

4. Estimation of the mean weight of pro- and postlarvae obtained by measuring specimens and averaging this value over the distribution of larval fish lengths within an age class.

5. Estimation of rate of growth by assuming that the change in mean weight of an age class is proportional to the mean weight.

6. Estimation of age-specific survival by combining literature estimates with values obtained via a modified Horst model.

7. Use of the estimates in 1 through 6 (above) to calculate production foregone.

Rago's model allowed the following points to be developed (they are presented in detail in his manuscripts):

1. Predicted lost potential for growth of various life stages entrained or impinged at the Cook Plant.

2. Attributed production foregone to each life stage killed.

3. Predicted production foregone per individual of each life stage.

4. Predicted production foregone by year of loss into the future.

5. Sensitivity coefficients for each model parameter.

6. Multiple linear regressions of simultaneous sensitivity analyses for survival rates in the first year of life.

7. Effect of reduced entrainment mortality on pro- and postlarvae.

8. Effect of various intake screening schemes on production foregone.

9. Impact (non-availability to salmonids) of forage fish production foregone results.

Production foregone estimates ranged from 15,252 kg in 1977 to 60,451 kg in 1979 (Table 48). Actual biomass losses ranged from 481 kg in 1974 to 6,588 kg in 1979. The ratio of production foregone to actual biomass lost was usually less than 10 except for 1977 (16) and 1974 (75). Overall, from 1974 to 1979, production foregone was 8.5 times as large as the actual loss of biomass. Ichthyoplankton was the primary contributor to Cook Plant production foregone estimates.

An analysis of the age-groups that would have been produced from these larvae indicates that production foregone losses during transition from postlarvae to age 0 were substantial, second only to losses by the age-0 to age-1 group (Table 48). For all years listed, the production foregone biomass loss of pro- to postlarvae was minor.

In Rago's model, entrainment mortality is assumed to be 100%. If, in fact, the actual mortality was only 75%, production foregone would be reduced annually by 20 to 25% (Table 49). Screening devices can be used to reduce production foregone. Rago (1983) evaluated two hypothetical screening devices. The first screen excluded individuals longer than 50 mm. In all

Table 48. Predicted production foregone biomass (kg) lost by various age-groups. Fish were entrained or impinged at the D. C. Cook Plant, southeastern Lake Michigan, 1974-1979. Adapted from Rago (1983).

Year	% Due to entrain-ment	Prolarvae to post larvae	Post larvae to age 0	Age 0 to age 1	Age 1 to age 2	Age 2 to age 3	Age 3 to age 4	Age 4 to age 5	Age 5 to age 6	Total production foregone (kg)
1974	99.9	85	11,228	12,175	10,874	630	975	277	69	36,312
1975	99.1	32	11,260	14,609	8,026	2,942	1,711	407	170	39,159
1976	98.6	80	8,712	10,122	6,966	297	1,129	414	145	27,865
1977	98.6	35	4,568	5,345	4,354	193	549	110	48	15,252
1978	96.4	49	7,830	4,422	4,619	23	551	283	170	17,948
1979	95.5	235	17,096	21,686	18,463	794	1,471	499	207	60,450

Table 49. Effectiveness of various mitigation measures in reducing actual biomass lost and production foregone. P.F. = production foregone; A.B. = actual biomass. Adapted from Rago (1983).

			Mitigation measure				
			Reduce entrainment mortality by 25%	Screen adults > 50 mm		Screen adults > 100 mm	
Year	Estimated production foregone (kg)	Actual biomass lost (kg)	% Decrease in P.F.	% Decrease in P.F.	% Decrease in A.B.	% Decrease in P.F.	% Decrease in A.B.
1974	36,312	481	25.0	0.1	99.9	0.1	85.7
1975	39,159	5,567	23.8	0.9	100	0.8	99.3
1976	27,865	3,460	24.7	1.4	100	1.0	97.3
1977	15,252	940	24.6	1.3	100	0.4	92.6
1978	17,948	5,984	24.1	3.5	100	2.6	97.9
1979	60,450	6,588	23.9	4.5	100	0.5	89.2

years this device would virtually eliminate impingement but would only have a very minor effect on production foregone. The reduction in production foregone for 1974-1979 would have ranged from 0.1% to 4.5% (mean = 2%). The second screen (excluding individuals > 100 mm) would also significantly reduce actual biomass (impingement) lost, but would have an insignificant effect on total production foregone (annual mean 1974-1979: 0.9%).

Production foregone losses do not occur over a short time period. They are distributed over the life span of a particular cohort. The temporal distribution of the production foregone losses at the Cook Plant (Table 50) showed that within 1 yr of actual entrainment and impingement loss, an average of 32% of the production foregone would have been realized. Within 2 yr about 67% and within 3 yr 94% of the average production foregone loss would have occurred.

Rago indicates that most production foregone is directly attributable to entrainment, while the actual biomass loss is primarily the result of impingement. The evaluation of potential impact of plant operation on Lake Michigan fisheries must consider both immediate and future effects. The question of which effect is more important and more relevant when effecting mitigation is difficult to resolve. Production foregone is highly uncertain, whereas actual losses are subject only to sampling error. Production foregone uncertainty increases over time as a result of assumptions of stable growth and mortality schedules for the population, increasing sensitivity and dependency of the model on estimates of key parameters (particularly first-year larvae mortality), variation in population structures, and absence of compensatory population mechanisms.

Production foregone uncertainty is probably low in the first year of estimate because compensatory processes would be unlikely to have had much effect in 1 yr. Thus, first-year production foregone estimates may be regarded as reasonably sound. As future growth and survival change, production foregone estimates would also be altered. If fish populations readily compensate for additional sources of mortality, production foregone losses would be less than those predicted by Rago's model. Compensation has been the topic of many papers and symposia (see Van Winkle 1977).

Table 50. Summary of production foregone in kg by year of predicted loss. Total biomass loss = actual biomass lost + production foregone. Adapted from Rago (1983).

Year	Biomass actually lost (kg)	Production foregone years into future							Total production foregone	Total biomass lost
		1	2	3	4	5	6	7		
1974	481	11,336	12,177	10,870	630	971	267	59	36,312	36,793
1975	5,567	11,581	14,631	8,003	2,926	1,653	304	60	39,159	44,726
1976	3,460	9,083	10,149	6,932	299	1,044	300	56	27,865	31,325
1977	940	4,732	5,338	4,292	197	530	135	27	15,252	16,192
1978	5,984	8,342	4,495	4,513	32	424	113	28	17,948	23,932
1979	6,588	18,820	21,541	17,456	828	1,365	354	80	60,451	67,039

RECOMMENDATIONS FOR REDUCTION OF ENTRAINMENT LOSSES

Screening Devices

The exclusion of fish larvae from power plant intakes by the use of screens has received considerable attention. The application of these technologies may, however, have limited use at the Cook Plant. Here we briefly review the experience at the J. H. Campbell Plant where Unit 3 intakes were constructed with 9.4-mm square mesh wedge-wire screen to reduce impingement and entrainment (Schneeberger and Jude 1981, Jude et al. 1982). The use of mesh screens and large screenfields necessary to accommodate the large volumes of water required for condenser cooling at relatively low intake velocities requires the development of a large area of lake substrate, including the addition of crushed limestone riprap and the intake screen structures. At Campbell, the ratio of entrained larvae densities to field densities was substantially less than the 11 fold difference predicted by Zeitoun et al. (1981) based on small-scale lake testing. In full-scale field operation, Unit 3 entrainment densities at Campbell were roughly equal to field densities. In general, entrained larvae were smaller (< 9 mm) than field-caught larvae (2.5-25 mm). Additionally, the extensive riprap area attracted fish, most importantly, substantial numbers of yellow perch which spawn on the riprap. At the Cook Plant (without screens), entrainment:field ratios were very similar, as were larvae length groups (Perrone et al. 1984). From 1975 to 1979, 86% of entrained larvae were less than or equal to the 9-mm length exclusion limit of the Campbell screens. In 1981, the same year covered by the Campbell study, over 91% of larvae entrained at Cook were less than or equal to the 9-mm limit.

Results of the Campbell studies suggest that while the 9.5-mm, wedge-wire screen is effective in eliminating impingement and reducing the entrainment of larger larvae, it probably would not be effective in substantially reducing entrainment at the Cook Plant or the associated ecological penalties associated with production foregone forecasts. A statistical approach forwarded by Schneeberger and Jude (1981) to evaluate different screen slot sizes indicates that 2.0-mm wedge-wire screen would not significantly reduce entrainment of the more numerous smaller larvae during the summer months. Additional problems of the wedge-wire screens at Campbell include more rapid biofouling, more maintenance than projected, and attraction of fish to the riprap and screen field. Yellow perch, a gamefish and commercial species, was the dominant species entrained at Campbell's Unit 3, while at other Campbell intakes (and at Cook) alewives dominated entrainment losses. In summary, the prevention of larger larvae

from being entrained by the use of stationary screens may be overshadowed by the availability of a large riprap and screenfield in a previously featureless area of Lake Michigan as the riprap increases surface area and shelter for potential fish-food organisms and provides a spawning substrate and habitat for additional fish species. This screening type and structure, if used at Cook, would eliminate impingement and cause a minor (10-15%, if any) reduction in entrainment losses.

Intake Placement

The location of intake structures can have a substantial influence on the magnitude of entrainment losses. The placement of the Cook Plant intakes appears to have successfully balanced engineering and biological considerations, although the latter may have been more accidental than preplanned because the intakes were not specifically designed to reduce or prevent entrainment losses. Cook Plant intakes were designed primarily to withstand the harsh environment (heavy ice conditions) common to this area of Lake Michigan. Fortunately, few important gamefish use the intake area extensively nor is it a unique spawning, nursery, or feeding area. A more thorough discussion of alternative intake designs and considerations may be found in Indiana & Michigan Electric Company (IMEC) (1979).

Our examination of biological data collected in the vicinity of the Cook Plant indicates that the 7.3-m intake depth probably reduces entrainment losses when compared to its placement in shallower water. Although fish larvae field distributions are often inconsistent in relation to water depth, time of day, season, and year, general observations support the contention that alewife larvae densities decline substantially with depth and therefore distance offshore (Fig. 33). Larvae mean densities (1975-1979 means for combined samples) are maximal (1,870/1,000 m^3) in the beach zone and as depth increases, density substantially decreases: 6 m - 597/1,000 m^3, 9 m - 388/1,000 m^3, and 21 m - 57/1,000 m^3. Similarly, data collected at the J. H. Campbell Plant indicated that during most years (1977-1981) the major site of concentration of alewife larvae was primarily less than 6 m, except during years when upwellings were rare, and alewives were found to be widely distributed out to the 15-m contour. The actual distribution of larvae appears to be dependent upon upwellings which may act as regulating mechanisms at these depths (Heufelder et al. 1982, Jude et al. 1982).

Distribution of important fish-food organisms, specifically *Pontoporeia hoyi* and *Mysis relicta*, indicates a direct relationship with depth (Fig. 34). Substantial increases in density occur as depth increases (IMEC 1979). IMEC (1979)

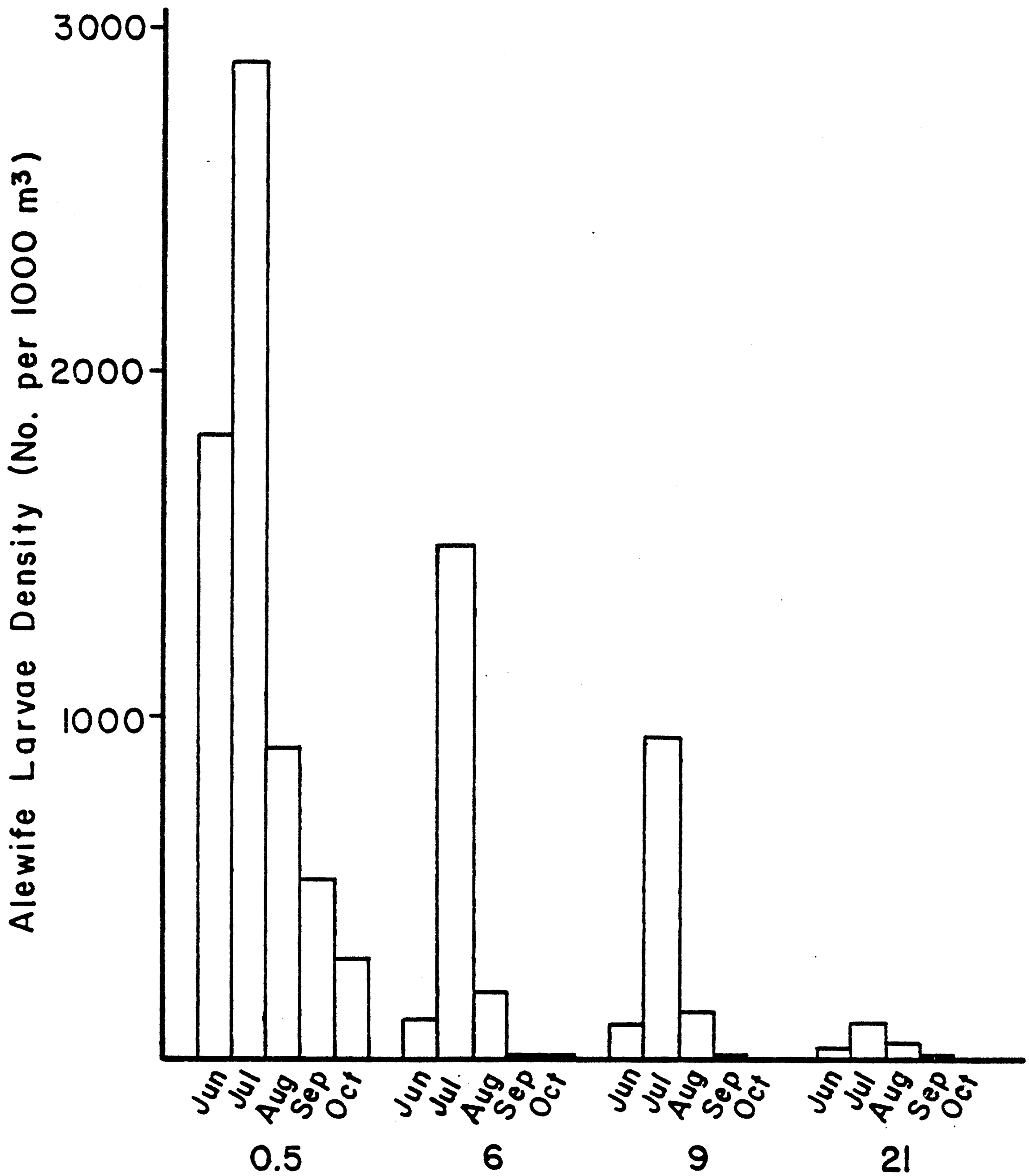

Figure 33. Depth distribution of alewife larvae in the vicinity of the D. C. Cook Plant, southeastern Lake Michigan, from June to October, 1975-1979. All samples from beach (A, B, F), 6-m (C, G, R), 9-m (D, H), and 21-m (E, W) stations were included in this analysis. See Appendixes 6-12 for sample sizes and additional sample information.

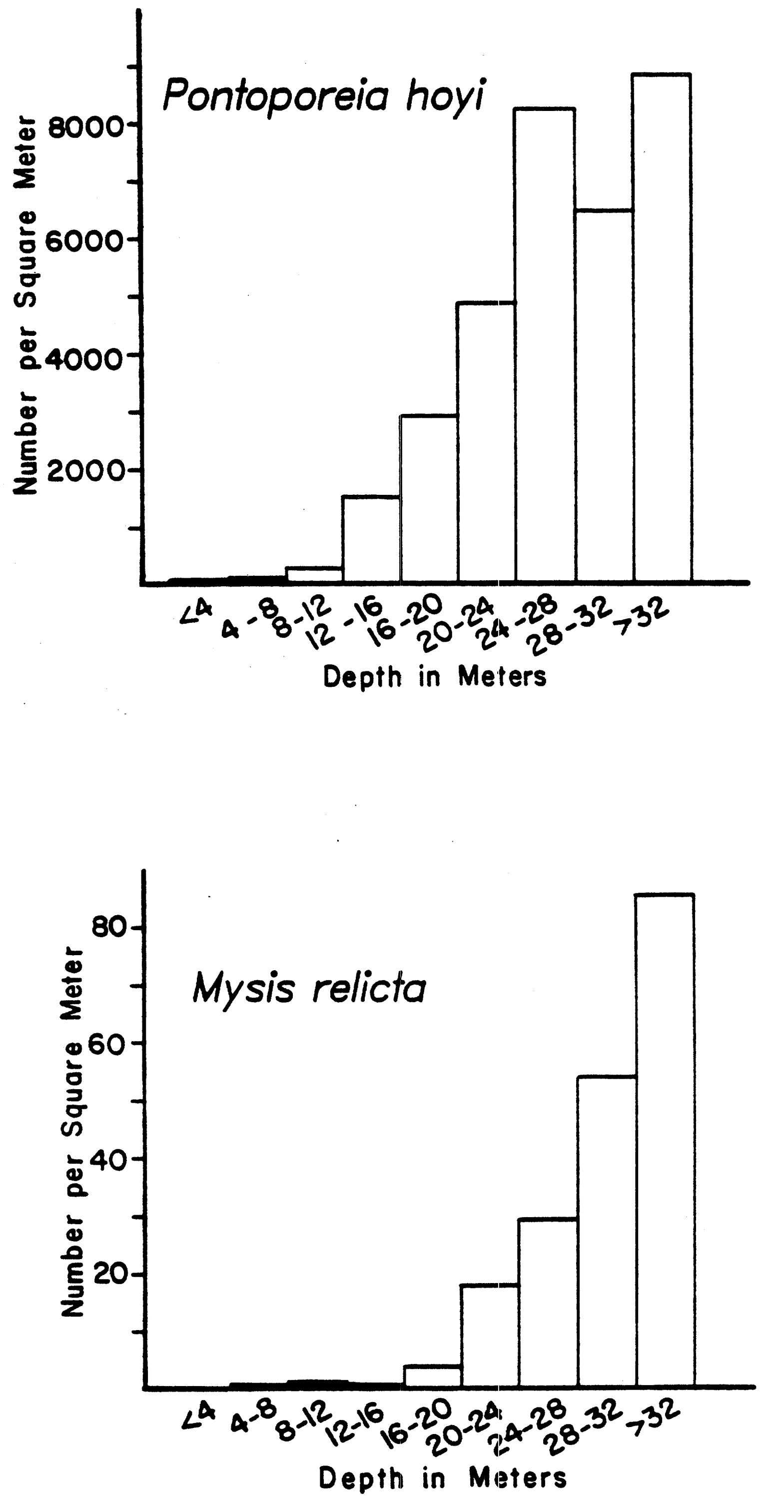

Figure 34. Depth distribution of benthic *Pontoporeia hoyi* and *Mysis relicta* in the vicinity of the D. C. Cook Plant, southeastern Lake Michigan (M. Winnell, Great Lakes Res. Div., Univ of Mich., Ann Arbor, Mich., personal communication).

estimated that moving Cook Plant intakes farther offshore would result in substantial entrainment increases for both species. Densities of *Pontoporeia hoyi* in intake waters (currently 0.05-0.1/m^3) would increase to more than 1.0/m^3 at 12 m and 1.75-3.5/m^3 at 15 m. Coincidentally, *Mysis relicta* densities would increase approximately 10 times at 15 m and 100 times at 22 m. Therefore, relocation of the intakes at greater depths, while possibly reducing fish larvae entrainment, might impact local populations of *Pontoporeia* and *Mysis*.

Changes in Plant Operation

The circulating water system flow rates at the Cook Plant often have a direct relationship with the numbers of larvae entrained. Reductions in water volumes used for condenser cooling during specific periods (June, July, and August) of increased larval fish densities could substantially reduce entrainment losses. Reductions in plant operations, e.g., for periodic maintenance or refueling, should be (and usually are) scheduled to coincide with months of greatest larvae abundance. The refueling cycle for Unit 1 is 12 mo, Unit 2 is 18 mo. The potential for reduction in annual entrainment losses (1975-1979) approached 16 million larvae for every 5% reduction in flow during those years. These reductions in entrainment losses could have been attained by a combination of rescheduling, refueling, and maintenance, or by diel variation in the circulating water pumping schedules. These operational changes might accrue substantial cost to IMEC. IMEC (1979) evaluated the biological and economic impacts of reducing the flow rate of the circulating water system. Their analysis used a 183-day period from 1 April to 30 September. Their "thought experiment" considered the removal from service of one pump from Unit 1 and one or two pumps from Unit 2. It should be noted that, had any such "thought experiment" been conducted, it would have resulted in violation of Nuclear Regulatory Commission (NRC) environmental technical specifications calling for a Δ T not exceeding 12.1C° for Unit 1 and 9.3C° for Unit 2. The results of IMEC's analysis are indicated in Table 51.

Operation at temperatures less than the inlet temperature specified (21°C) would result in reduced power generation from full load. IMEC estimated that such a schedule of plant operation would result in a loss of approximately $833,600 (1978 dollars) with a realization that the entrainment loss reduction would be worth (in terms of the production foregone analysis available at that time) approximately $144,600. From these analyses, IMEC concluded that such a schedule was not cost effective. A reevaluation of such an operational schedule with the time period considered reduced to 1 June - 30 August (91

Table 51. Effect of reduced circulating water flow at 21°C inlet temperature on unit Δ T, condenser backpressure, and electrical generation. The reduction from design flow rate is calculated on the basis of a maximum flow of 6,100 m^3/min with all seven circulating pumps in service. The decrease in electrical output column considers a 2 Mw credit per idled pump for reduced auxiliary power requirements. Adapted from IMEC (1979).

Unit no.	No. of circ. water pumps in service	Total circ. pump flow rate (m^3/min)	Reduction from design flow rate (%)	Δ T (C°)	Condenser backpressure (mm HgA)	Decrease in electrical output (%)
1	3	2,687	Base	11.5	2.35	Base
1	2	2,157	8.7	14.3	2.75	0.4
2	4	3,418	Base	9.2	1.96	Base
2	3	2,990	7.0	10.6	2.16	0.6
2	2	2,320	18.0	13.6	2.63	2.2

days) is recommended. Our data indicate that in most years over 90% (usually over 95%) of the annual entrainment loss occurs over that time interval. Additionally, attention could be directed to varying pumping rates at night because most larvae (approximately 60-80%) are entrained during the night. All of these changes in plant operation would result in violations of NRC Δ T specifications. If entrainment losses at Cook are ever considered ecologically prohibitive, some flexibility of these rules, within prescribed limits, may be justified in light of our examination of entrainment data, as well as our knowledge concerning thermal plume impacts on local fish populations in the vicinity of the Cook Plant (see Tesar et al. 1984, Jude et al. 1980b).

PERSPECTIVES ON COOK PLANT ENTRAINMENT LOSSES

Almost 350 million fish larvae have been entrained at the Cook Plant since 1975. Of 16 Lake Michigan power plants sampled in 1975 (Spigarelli et al. 1981), the Cook Plant was rated first in terms of numbers of alewife larvae entrained, seventh in rainbow smelt entrainment, and second (of three reporting) in yellow perch entrainment. In most recent years the Cook Plant has contributed substantially to Lake Michigan entrainment losses (Table 52). Potentially important sport or commercial fish entrained at the Cook Plant in the 5-yr period from 1975 to 1979 were: yellow perch (5 million larvae), rainbow smelt (2.7 million larvae), and coregonids (85,000 larvae). No other major gamefish species (lake trout, other trout or salmon, centrarchids, esocids, etc.) have been found in entrainment samples.

Entrainment losses are a result of a combination of plant-induced stresses including:

1) mechanical stresses - impact and abrasion with the internal surfaces of the system (screens, impellers, heat exchangers, jet diffusers, etc.) and system-induced forces (shear, cavitation, etc.).

2) thermal stress.

3) pressure changes - supersaturation of gases, gas bubble disease, etc.

4) exposure to toxicants - chlorine used for cleaning condenser tubes and miscellaneous effluent released into the discharge.

Table 52. Entrainment losses (estimated numbers of larvae) of alewife, rainbow smelt, and yellow perch at a number of Lake Michigan power plants. NR - not reporting.

Power plant	Alewife	Rainbow smelt	Yellow perch
Bailly, 1975 (Texas Inst., Inc. 1976)	4.08×10^7	3.13×10^5	1.5×10^4
Zion, 1975 (Cima et al. 1976)	1.13×10^7	4.33×10^5	NR
Waukegan, 1975 (Cima et al. 1976)	6.98×10^6	6.31×10^5	NR
Ludington, 1978 (Liston et al. 1980)	3.05×10^9	1.05×10^8	3.68×10^7
Ludington, 1979 (Liston et al. 1981)	3.95×10^8	1.08×10^8	4.27×10^7
Campbell, 1978 (Jude et al. 1979a)	5.1×10^7	1.7×10^6	1.8×10^7
Campbell, 1979 (Jude et al. 1980a)	2.3×10^7	1.6×10^6	1.5×10^7
Cook Plant, 1975	6.4×10^7	1.4×10^6	1.8×10^5
1976	5.4×10^7	4.5×10^5	3.8×10^4
1977	2.7×10^7	1.8×10^5	1.3×10^6
1978	3.1×10^7	3.5×10^5	3.1×10^6
1979	1.3×10^8	3.7×10^5	3.8×10^5

Most of these stresses and their biological implications have been the subject of numerous symposia and reviews (Krenkel and Parker 1969; Coutant 1970; Saila 1975; Sharma et al. 1976; Van Winkle 1977; Schubel and Marcy 1978; and Jensen 1977, 1978, 1981). In most cases, the potential for damage is plant-specific and attempts to generalize condenser-passage mortality are difficult. Marcy et al. (1978) reviewed larvae mortality at 16 power plants where mortality estimates ranged from 0 to 100% and averaged 72%. Liston et al. (1981) found survival at the Ludington Pumped Storage Facility (turbine passage only) to average 11.5%.

It is becoming increasingly clear that the widespread perception that fish larvae behavior mimics that of solute particles and their movement with water masses is inadequate. These data, in this as well as other reports (Perrone et al. 1984, Jude et al. 1982, Great Lakes Res. Div. unpublished data), suggest subtle indications of selective processes that act to influence larval fish behavior and larvae entrainment. The use of nearshore fish larvae abundance estimates to project entrainment levels probably does not adequately represent the potential for entrainment loss. Wallace (1978) and Heuer and Tomljanovich (1978) supported the contention that the transport of fish larvae is linked, not only to hydrodynamic conditions in the vicinity of the intakes, but also with larval fish behavior. Wallace (1978) suggested, and we concur, that utilities, when faced with expensive plant modifications (often based on poorly understood principles of larva and adult fish behavior), might be better served by developing intakes that would produce hydrodynamic conditions that would promote avoidance via visual or other sensory cues. Future work should target basic elements of behavior that could be applied to projections or models of how those behaviors are influenced by water currents and visual or other physical stimuli. Ultimately this work, along with other basic recommendations (siting studies, alteration of plant operating characteristics, etc.), may prove to be the most cost-effective measures available to reduce damage to nearshore biological systems.

In summary, we have documented the entrainment loss of fish larvae and eggs at the D. C. Cook Nuclear Plant. Entrained larvae demographics as well as their temporal and spatial distribution in southeastern Lake Michigan have been examined in an attempt to determine not only "how many," but also to delineate the segment of the population most susceptible to entrainment given the intake and operating system of the Cook Plant. We have also made preliminary recommendations regarding reduction of entrainment losses that considered the relationship between impact and cost-effective mitigation efforts.

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Appendix 1. Densities (no./1,000 m^3) for fish eggs and larvae entrained at the D. C. Cook Plant, southeastern Lake Michigan, 1975. Sample parameter codes are: Mpd (month period): consecutive number of the sample period during the annual sample program. Ser (series): (1) standard series, (2) supplemental sample, (3) problems-sample not used in calculations. Grt (grate): location of forebay grate, see Fig. 3 for reference. N/S (north/south): further designation of sampling location at each grate, (1) north, (2) south, (3) no designation, see Fig. 3 for reference. Dpt (depth): depth (m) of sampling in the forebay. Dl (diel): (N1) midnight to dawn, (D1) dawn to noon, (D2) noon to dusk, (N2) dusk to midnight, (LD and LN) long day or long night, samples extending beyond normal diel schedule, (OD and ON) other day or other night, sampling was performed at irregular intervals. Temp: temperature (C) of intake water when the sample was collected. Refer to Table 1 for species designation. Blank entries indicate zero densities.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	Dl	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
1-02-75	1	2	9	3	5	LN	1.0																				0	0
1-22-75	2	2	3	2	5	LN	0.0																				0	0
1-22-75	2	2	9	3	5	LN	0.0																				0	0
1-23-75	2	1	9	3	5	D1	0.0																				0	0
1-29-75	3	2	3	2	5	LN	0.5																				0	0
1-29-75	3	2	9	3	5	LN	0.8																				0	0
1-30-75	3	2	3	2	5	LD	0.5																				0	0
1-30-75	3	2	9	3	5	LD	0.8																				0	0
2-25-75	4	1	3	2	5	N1	2.2																				0	0
2-25-75	4	1	9	3	5	N1	2.5																				0	20
2-26-75	4	1	3	2	5	N2	2.1																				0	24
2-26-75	4	1	3	2	5	D1	4.3																				0	0
2-26-75	4	1	3	2	5	D2	5.5																				0	0
2-26-75	4	1	9	3	5	N2	3.1																				0	14
2-26-75	4	1	9	3	5	D1	5.2																				0	0
2-26-75	4	1	9	3	5	D2	6.9																				0	44
3-11-75	5	1	3	2	5	N1	6.9																				0	0
3-11-75	5	1	9	3	5	N1	9.7																				0	0
3-12-75	5	1	3	2	5	N2	6.1																				0	0
3-12-75	5	1	3	2	5	D1	5.8																				0	0
3-12-75	5	1	3	2	5	D2	5.8																				0	0
3-12-75	5	1	9	3	5	N2	9.2																				0	0
3-12-75	5	1	9	3	5	D1	8.8																				0	0
3-12-75	5	1	9	3	5	D2	9.1																				0	0
4-15-75	6	1	3	1	5	N1	4.1																				0	0
4-15-75	6	1	9	3	5	N1	12.2																				0	19
4-16-75	6	1	3	1	5	N2	3.9																				0	15
4-16-75	6	1	3	1	5	D1	3.9																				0	0
4-16-75	6	1	3	1	5	D2	4.2																				0	0
4-16-75	6	1	9	3	5	N2	11.1																				0	0
4-16-75	6	1	9	3	5	D1	10.5																				0	0
4-16-75	6	1	9	3	5	D2	11.5																				0	0
4-22-75	7	1	3	1	5	N1	4.2																				0	17

Appendix 1. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	D1	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
4-22-75	7	1	9	3	5	N1	16.5																				0	0
4-23-75	7	1	3	1	5	N2	4.1																				0	15
4-23-75	7	1	9	3	5	N2	16.1																				0	17
4-23-75	7	1	3	1	5	D1	4.1																				0	15
4-23-75	7	1	9	3	5	D1	16.1				18																18	0
4-23-75	7	1	3	1	5	D2	4.1																				0	12
4-23-75	7	1	9	3	5	D2	16.1																				0	41
5-12-75	8	1	9	3	5	D2	16.0			105				15												15	135	981
5-12-75	8	2	3	3	1	D2	8.0			34																34	68	5979
5-12-75	8	2	9	3	5	LN	14.5																				0	143
5-12-75	8	3	3	3	1	LN	6.0																				0	1184
5-13-75	8	2	9	3	5	LD	15.0			6																	6	19
5-13-75	8	3	3	3	1	LD	7.0	19																			19	19
5-13-75	8	2	3	3	8	N1	7.0																				0	0
5-13-75	8	1	9	3	5	N1	16.8																				0	67
5-13-75	8	2	3	3	8	N2	8.0																				0	0
5-13-75	8	1	9	3	5	N2	16.8			46																	46	15
5-14-75	8	2	9	3	5	LN	17.0																				0	11
5-14-75	8	2	3	3	2	LN	8.0																				0	0
5-14-75	8	2	3	3	8	D1	8.5			34																	34	17
5-14-75	8	1	9	3	5	D1	17.7																				0	20
5-14-75	8	2	3	3	8	D2	8.9																				0	0
5-14-75	8	1	9	3	5	D2	17.5																				0	0
5-15-75	8	2	3	3	2	LD	8.7																				0	0
5-15-75	8	2	9	3	5	LD	16.9																				0	13
5-15-75	8	2	3	3	1	LN	9.5	49		49																	98	66
5-15-75	8	2	9	3	5	LN	16.0			6																	6	0
5-16-75	8	2	9	3	5	LD	15.0																				0	10
5-16-75	8	2	3	3	1	LD	7.0	30		90																	120	30
5-21-75	9	2	3	3	5	LN	14.8			9																	9	0
5-21-75	9	2	9	3	5	LN	1.9							21													21	21
5-22-75	9	1	3	3	5	D1	14.5																				0	0
5-22-75	9	1	9	3	5	D1	21.7			12																	12	0
5-22-75	9	2	3	3	5	LD	14.0			30																	30	0
5-22-75	9	2	9	3	5	LD	21.6																				0	0
5-27-75	10	2	3	1	5	LN	16.4																				0	6396
5-27-75	10	2	2	1	5	LN	16.3																				0	7334
5-27-75	10	2	1	1	5	LN	16.4																				0	7354
5-28-75	10	2	3	1	5	LD	16.6																				0	218
5-28-75	10	2	2	1	5	LD	16.4																				0	247
5-28-75	10	2	1	1	5	LD	16.7																				0	186
5-28-75	10	2	3	1	5	LN	16.0																				0	12040
5-28-75	10	2	2	1	5	LN	15.9																				0	10332
5-28-75	10	2	1	1	5	LN	16.1																				0	6522
5-29-75	10	1	3	1	5	D1	15.4																				0	2274

Appendix 1. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	D1	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
5-29-75	10	1	2	1	5	D1	15.5																				0	619
5-29-75	10	2	1	1	5	D1	15.6																				0	991
5-29-75	10	2	3	1	1	LN	15.7																				0	1090
5-29-75	10	2	3	1	5	LN	15.6																				0	1121
5-29-75	10	3	3	1	9	LN	15.7																				0	107
6-04-75	11	2	9	3	5	LD	23.7																				0	717
6-04-75	11	2	9	3	5	LN	24.9	261																			261	5247
6-04-75	11	2	3	1	5	LN	17.6	2432														11					2443	5782
6-05-75	11	1	9	3	5	D1	23.9	28							14												42	2192
6-05-75	11	1	3	1	5	D1	17.5	446																			446	665
6-05-75	11	1	3	1	5	D2	17.2	280	20					50													350	522
6-05-75	11	2	3	2	1	D2	17.1	57						139													196	2207
6-05-75	11	2	3	2	1	LN	18.2	1835						12	24							24					1895	7421
6-06-75	11	2	3	2	1	D1	17.2							12													12	948
6-10-75	12	3	3	1	5	N1	13.6	763	63					63		63											952	2489
6-10-75	12	1	3	1	5	N2	11.1	292	146					18													456	7251
6-10-75	12	3	9	3	5	N1	21.3	459	230					287	57												1033	2312
6-10-75	12	1	9	3	5	N2	19.9	146	129					129													404	7034
6-11-75	12	1	3	1	5	D1	11.6	126																			126	2703
6-11-75	12	1	3	1	5	D2	13.6	18																			18	2201
6-11-75	12	2	3	2	9	N2	11.3	715	122					15													852	11943
6-11-75	12	2	3	2	9	D1	11.3	48						16													64	2456
6-11-75	12	2	3	2	9	D2	13.6	84						8													92	5135
6-11-75	12	1	9	3	5	D1	19.7							54													54	1346
6-11-75	12	1	9	3	5	D2	21.6	65	13					26													104	1214
6-17-75	13	2	3	2	9	D2	18.0																				0	522
6-17-75	13	1	3	1	5	D2	18.0	65		16				33													114	67
6-17-75	13	1	9	3	5	D2	25.7																				0	970
6-17-75	13	2	3	2	9	N1	18.1		40						26												66	2462
6-17-75	13	1	3	1	5	N1	18.1	76				31		46													153	1769
6-17-75	13	1	9	3	5	N1	25.1	317																			317	714
6-18-75	13	2	3	2	9	N2	18.4	266																			266	934
6-18-75	13	1	3	1	5	N2	18.4			16																	16	660
6-18-75	13	1	9	3	5	N2	26.1	25								25											50	3055
6-18-75	13	2	3	2	9	D1	17.8	13																			13	237
6-18-75	13	1	3	1	5	D1	17.5	30																			30	182
6-18-75	13	1	9	3	5	D1	25.0	290						79													369	1299
6-18-75	13	2	3	2	9	D2	18.4	26						13													39	320
6-18-75	13	1	3	1	5	D2	18.4	454								15						15					484	197
6-18-75	13	1	9	3	5	D2	26.0	226																			226	431
6-18-75	13	2	3	2	9	N1	19.5	352	42			58				29											481	3245
6-18-75	13	1	3	1	5	N1	19.5	15	15					15		15											60	1414
6-18-75	13	1	9	3	5	N1	27.3	29						146		29											204	4239
6-18-75	13	2	3	2	9	N2	18.3	157						13	39	26											235	7423
6-18-75	13	1	3	1	5	N2	18.5	582	15		15			91													703	6840

Appendix 1. Continued.

	Sample parameters							Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	Dl	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
6-18-75	13	1	9	3	5	N2	25.0	374																			374	6863
6-19-75	13	2	3	2	9	D1	18.9																				0	718
6-19-75	13	1	3	1	5	D1	18.9	15	15					15													45	593
6-19-75	13	1	9	3	5	D1	26.7	54																			54	2203
6-19-75	13	2	3	2	9	D2	19.0							70													70	339
6-19-75	13	1	3	1	5	D2	19.0	45																			45	657
6-19-75	13	1	9	3	5	D2	26.5	136	27					81													244	1242
6-19-75	13	2	3	2	9	N1	18.9	52				13															65	3587
6-19-75	13	1	3	1	5	N1	19.0		30																		30	2563
6-19-75	13	1	9	3	5	N1	26.7		21							21											42	1746
6-24-75	14	2	3	2	9	D2	21.5	20	30																		50	1216
6-24-75	14	1	3	1	5	D2	20.0																				0	354
6-24-75	14	1	9	3	5	D2	29.0	198						39													237	1155
6-24-75	14	2	3	1	5	LN	21.0	180						60													240	12452
6-24-75	14	2	3	2	9	LN	21.0	18																			18	16355
6-24-75	14	2	9	3	5	LN	21.0	1842	104					221													2167	32846
6-25-75	14	1	3	1	5	D1	20.0	14						56													70	969
6-25-75	14	2	3	2	9	D1	20.0	237	12																		249	1706
6-25-75	14	1	9	3	5	D1	21.0					19		38													57	2416
6-25-75	14	2	3	2	9	D2	21.2							16													16	1478
6-25-75	14	1	3	1	5	D2	21.2	36	56																		92	774
6-25-75	14	1	9	3	5	D2	21.5	226						50													276	2137
6-25-75	14	2	3	2	9	N1	21.4	650																			650	1303
6-25-75	14	1	3	1	5	N1	21.4	16	32					225												16	289	455
6-25-75	14	1	9	3	5	N1	21.4	280	70		23			93													466	2928
6-25-75	14	1	3	1	5	N2	18.7																				0	471
6-25-75	14	2	3	2	9	N2	18.7	188																			188	4472
6-25-75	14	1	9	3	5	N2	19.2	194	19																		213	11228
6-26-75	14	2	3	2	9	D1	18.9	33																			33	2575
6-26-75	14	1	3	1	5	D1	19.0	12																			12	573
6-26-75	14	1	9	3	5	D1	19.1							34													34	3737
6-30-75	15	2	3	2	9	D2	9.3	42																			42	967
6-30-75	15	1	3	1	5	D2	9.3																				0	1319
6-30-75	15	1	9	3	5	D2	17.2																				0	546
6-30-75	15	2	3	2	9	N1	10.8							34													34	278
6-30-75	15	1	3	1	5	N1	10.8	35																			35	35
6-30-75	15	1	9	3	5	N1	18.4	92																			92	373
6-30-75	15	2	3	2	9	N2	9.8	41						10													51	193
6-30-75	15	1	3	1	5	N2	9.8																				0	508
7-01-75	15	2	3	2	9	D1	12.5																			29	29	862
7-01-75	15	1	3	1	5	D1	12.5																				0	170
7-01-75	15	1	9	3	5	D1	19.5							90													90	5582
7-01-75	15	2	3	2	9	D2	13.1							12													12	88
7-01-75	15	1	3	1	5	D2	13.5																				0	0
7-01-75	15	1	9	3	5	D2	21.5	39																			39	334
7-01-75	15	1	3	1	5	N1	14.0	39																			39	0

Appendix 1. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	Dl	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
7-01-75	15	1	9	3	5	N1	21.6							45													45	684
7-02-75	15	2	3	2	9	D2	14.2	12																			12	114
7-02-75	15	1	3	1	5	D2	14.5																				0	24
7-03-75	15	1	3	1	5	D1	17.5	149	37																		186	1614
7-03-75	15	1	9	3	5	D1	24.8	42																			42	1245
7-08-75	16	2	3	2	9	N1	23.0	2298	70					142													2510	4962
7-08-75	16	1	3	1	5	N1	23.0	376						34													410	16263
7-08-75	16	1	9	3	5	N1	23.7	4235	39					1136													5410	20757
7-08-75	16	2	3	2	9	N2	20.0	144	16					16								16					192	12313
7-08-75	16	1	3	1	5	N2	19.8																				0	3852
7-08-75	16	1	9	3	5	N2	19.5	9599	17																		9616	22774
7-09-75	16	2	3	2	9	D1	17.1	19	19																		38	630
7-09-75	16	1	3	1	5	D1	17.0																				0	2680
7-09-75	16	1	9	3	5	D1	17.0	123						1416													1539	1563
7-09-75	16	2	3	2	9	D2	17.8	395						50													445	2186
7-09-75	16	1	9	3	5	D2	18.0	70						14													84	0
7-09-75	16	2	3	2	9	LN	17.8	48	12																		60	557
7-09-75	16	2	9	3	5	LN	18.0	241	26																		267	4500
7-15-75	17	2	3	2	1	N1	21.9	177	50					125													352	585
7-15-75	17	1	3	1	5	N1	22.0	47	23																		70	235
7-15-75	17	1	9	3	5	N1	21.9	1503	311					141													1955	1703
7-16-75	17	2	3	2	1	N2	22.0	85	109																		194	371
7-16-75	17	1	3	1	5	N2	22.1	48	48					32								16					144	651
7-16-75	17	1	9	3	5	N2	21.9	165	130					73													368	1694
7-16-75	17	2	3	2	1	D1	21.6	22																			22	45
7-16-75	17	1	3	1	5	D1	21.6	184																			184	103
7-16-75	17	1	9	3	5	D1	21.5							46													46	347
7-16-75	17	2	3	2	1	N1	23.0	436	17					262													715	402
7-16-75	17	1	3	1	5	N1	22.1	465	354					322													1141	420
7-16-75	17	1	9	3	5	N1	22.8	351	36					37													424	965
7-17-75	17	2	3	2	1	LN	22.1	351	22					22													395	137
7-17-75	17	2	3	1	5	LN	22.0	1916	201					169													2286	296
7-17-75	17	2	9	3	5	LN	22.0	1040	12					48													1100	509
7-18-75	17	1	3	1	5	N2	23.1	78																			78	1008
7-18-75	17	2	3	2	1	N2	22.8	774	28					71													873	1695
7-18-75	17	1	9	3	5	N2	23.0	507						45													552	3055
7-21-75	18	2	3	2	1	N1	23.0																				0	204
7-21-75	18	1	3	1	5	N1	23.0	188	47																		235	141
7-21-75	18	1	9	3	5	N1	23.5	54																			54	270
7-21-75	18	2	3	2	1	N2	23.0	81																			81	3481
7-21-75	18	1	3	1	5	N2	23.0	15																			15	1944
7-21-75	18	1	9	3	5	N2	23.0																			17	17	4900
7-22-75	18	2	3	2	1	D1	22.5																				0	433
7-22-75	18	1	3	1	5	D1	22.2	198																			198	437
7-22-75	18	1	9	3	5	D1	22.2	414						20													434	271

Appendix 1. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	D1	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
7-22-75	18	2	3	2	1	D2	22.6	52																			52	289
7-22-75	18	1	3	1	5	D2	22.4	205						12													217	36
7-22-75	18	1	9	3	5	D2	22.6	52																			52	41
7-22-75	18	2	3	2	1	N1	23.5	795																			795	2122
7-22-75	18	1	3	1	5	N1	23.5	465	139		46																650	1350
7-22-75	18	1	9	3	5	N1	23.5	840						56													896	3480
7-22-75	18	2	3	2	1	N2	23.5	434						32													466	2002
7-22-75	18	1	3	1	5	N2	23.5	277	15					124													416	8405
7-22-75	18	1	9	3	5	N2	24.0	315	17	17				17													366	9505
7-23-75	18	2	3	2	1	D1	23.8							20													20	205
7-23-75	18	1	3	1	5	D1	23.6																				0	285
7-23-75	18	1	9	3	5	D1	24.5	193																			193	588
7-23-75	18	1	3	1	5	N1	24.3	1379						49													1428	593
7-23-75	18	1	3	1	5	N2	24.1	1467	17					51													1535	4797
7-23-75	18	2	3	2	9	N1	24.5	2049																			2049	1948
7-23-75	18	2	3	2	9	N2	24.2																				0	3290
7-23-75	18	1	9	3	5	N1	24.2	1749																			1749	2545
7-23-75	18	1	9	3	5	N2	24.2	5444	81					81													5606	15583
7-24-75	18	1	3	1	5	D1	24.0																				0	438
7-24-75	18	1	3	1	5	D2	24.1	68																			68	23
7-24-75	18	2	3	2	9	D1	24.0																				0	202
7-24-75	18	2	3	2	9	D2	24.1																				0	10
7-24-75	18	1	9	3	5	D1	24.2	697						30													727	790
7-24-75	18	1	9	3	5	D2	24.2							27													27	27
7-28-75	19	2	3	3	2	D2	23.0							24													24	195
7-28-75	19	2	3	3	5	D2	23.0	26																			26	625
7-28-75	19	2	3	3	9	D2	23.0	90																			90	2056
7-28-75	19	2	3	3	2	N1	23.5	48																			48	146
7-28-75	19	2	3	3	5	N1	23.5	234																			234	1225
7-28-75	19	2	3	3	9	N1	23.0	112	28																		140	312
7-28-75	19	2	3	3	2	ON	24.0	216						96													312	9369
7-28-75	19	2	3	3	5	ON	24.0	390	156																		546	19944
7-28-75	19	2	3	3	9	ON	23.5	28	84																		112	785
7-29-75	19	2	3	3	2	N2	21.5	24																			24	758
7-29-75	19	2	3	3	5	N2	21.5	130																			130	964
7-29-75	19	2	3	3	9	N2	21.5	78																			78	1816
7-29-75	19	2	3	3	2	D1	22.5																				0	171
7-29-75	19	2	3	3	5	D1	22.5	26																			26	599
7-29-75	19	2	3	3	9	D1	22.5																				0	2079
7-29-75	19	2	3	3	2	OD	23.0							24													24	0
7-29-75	19	2	3	3	5	OD	23.0																				0	52
7-29-75	19	2	3	3	9	OD	22.5	25																			25	913
7-29-75	19	2	3	3	2	D2	23.5																				0	48
7-29-75	19	2	3	3	5	D2	23.0	52																			52	234
7-29-75	19	2	3	3	9	D2	23.0	24																			24	199
7-29-75	19	2	3	3	2	N1	24.0	144	96																		240	293
7-29-75	19	2	3	3	5	N1	24.0	208	26					104												26	364	286

Appendix 1. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	Dl	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
7-29-75	19	2	3	3	9	N1	24.0	78	52																		130	743
7-29-75	19	2	3	3	2	ON	23.0	169		24				24													217	2005
7-29-75	19	2	3	3	5	ON	23.3	156						26													182	286
7-29-75	19	2	3	3	9	ON	23.2	78						26													104	929
7-30-75	19	2	3	3	2	N2	17.0	48																			48	97
7-30-75	19	2	3	3	5	N2	17.0	156						130													286	2033
7-30-75	19	2	3	3	9	N2	16.5							26													26	1009
7-30-75	19	2	3	3	2	D1	21.5	121						24													145	97
7-30-75	19	2	3	3	5	D1	21.5	52																			52	0
7-30-75	19	2	3	3	9	D1	21.5	105																			105	106
7-30-75	19	2	3	3	2	OD	23.0	97																			97	97
7-30-75	19	2	3	3	5	OD	23.0	104																			104	156
7-30-75	19	2	3	3	9	OD	23.0	26																			26	79
7-31-75	19	2	2	3	5	D2	13.5																				0	0
7-31-75	19	2	5	3	5	D2	14.0	26																			26	26
7-31-75	19	2	7	3	5	D2	14.5	26																			26	0
7-31-75	19	2	2	3	5	OD	13.0																				0	55
7-31-75	19	2	5	3	5	OD	13.5																				0	0
7-31-75	19	2	7	3	5	OD	13.5							26													26	26
7-31-75	19	2	2	3	5	N1	15.5	82																			82	192
7-31-75	19	2	5	3	5	N1	16.0	130	26																		156	104
7-31-75	19	2	7	3	5	N1	15.7	26																			26	26
8-01-75	19	2	2	3	5	ON	16.5	26	26																		52	214
8-01-75	19	2	5	3	5	ON	15.5	26																			26	78
8-01-75	19	2	7	3	5	ON	15.5																				0	156
8-01-75	19	2	2	3	5	D1	11.0	25																			25	25
8-01-75	19	2	5	3	5	D1	11.5	26																			26	0
8-01-75	19	2	7	3	5	D1	11.5																				0	26
8-01-75	19	2	2	3	5	D2	12.0	96																			96	24
8-01-75	19	2	5	3	5	D2	12.0	78																			78	0
8-01-75	19	2	2	3	5	OD	21.5	52																			52	78
8-01-75	19	2	5	3	5	OD	23.0	52																			52	104
8-01-75	19	3	7	3	5	OD	23.0	42																			42	42
8-01-75	19	2	2	3	5	N1	17.9	25	25																		50	150
8-01-75	19	2	5	3	5	N1	19.6	52																			52	52
8-01-75	19	2	7	3	5	N1	19.9	26						26													52	104
8-01-75	19	2	2	3	5	N2	20.0	54						27													81	217
8-01-75	19	2	5	3	5	N2	21.8	26						26													52	156
8-01-75	19	2	7	3	5	N2	21.6	26		26																	52	234
8-02-75	19	2	2	3	5	N2	12.8	50																			50	75
8-02-75	19	2	5	3	5	N2	12.5																				0	26
8-02-75	19	2	7	3	5	N2	12.5	52																			52	26
8-02-75	19	2	2	3	5	ON	11.0	25																			25	0
8-02-75	19	2	5	3	5	ON	11.0	26																			26	0
8-02-75	19	2	7	3	5	ON	11.0																				0	0
8-02-75	19	2	2	3	5	D1	17.0	102																			102	0
8-02-75	19	2	5	3	5	D1	18.0	104																			104	0
8-02-75	19	2	7	3	5	D1	17.5	130																			130	52

Appendix 1. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	D1	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
8-04-75	20	2	3	3	5	LD	15.5																				0	0
8-04-75	20	2	3	3	1	LD	14.5																				0	0
8-04-75	20	2	9	3	5	LD	22.3	7																			7	0
8-05-75	20	1	3	1	5	N2	14.5																				0	0
8-05-75	20	2	3	2	1	N2	14.0																				0	0
8-05-75	20	1	9	3	5	N2	21.7																				0	0
8-05-75	20	1	3	1	5	D1	15.0																				0	0
8-05-75	20	2	3	2	1	D1	15.3																				0	0
8-05-75	20	1	9	3	5	D1	23.3																				0	20
8-05-75	20	1	3	1	5	D2	14.0	26																			26	162
8-05-75	20	2	3	2	9	D2	15.5																				0	107
8-05-75	20	1	9	3	5	D2	21.9	15					15														30	30
8-05-75	20	2	3	1	5	LN	11.4																				0	32
8-05-75	20	2	3	2	9	LN	11.2	9																			9	199
8-05-75	20	2	9	3	5	LN	19.8	12					12		12												36	123
8-06-75	20	1	3	1	5	D1	11.0	18																			18	18
8-06-75	20	2	3	2	9	D1	10.8																				0	0
8-06-75	20	1	9	3	5	D1	19.2																				0	0
8-06-75	20	2	3	2	9	D2	10.0																				0	0
8-06-75	20	1	9	3	5	D2	18.0																				0	0
8-06-75	20	2	3	2	9	LD	10.0																				0	0
8-06-75	20	2	9	3	5	LD	18.2							56													56	0
8-11-75	21	1	9	3	5	N1	21.7			47																	47	0
8-11-75	21	1	9	3	5	N2	21.7	114																			114	0
8-11-75	21	1	3	1	5	N1	21.5	313																			313	52
8-11-75	21	1	3	1	5	N2	21.6	136																			136	0
8-12-75	21	3	9	3	5	D1	21.7																				0	0
8-12-75	21	3	3	1	5	D1	21.9																				0	0
8-13-75	21	1	9	3	5	D1	23.3																				0	0
8-13-75	21	1	9	3	5	D2	23.3																				0	0
8-13-75	21	1	9	3	5	N1	23.2																				0	0
8-13-75	21	1	9	3	5	N2	23.2	51																			51	0
8-13-75	21	1	3	1	5	D2	23.2																				0	0
8-13-75	21	1	3	1	5	N1	23.3	82																			82	0
8-13-75	21	1	3	1	5	N2	23.1																				0	0
8-14-75	21	1	9	3	5	D1	26.4																				0	0
8-14-75	21	1	3	1	5	D1	20.9																				0	0
8-18-75	22	1	3	1	5	N1	12.4																				0	44
8-18-75	22	2	3	2	9	N1	12.5																				0	0
8-18-75	22	1	9	3	5	N1	20.0																				0	0
8-19-75	22	1	3	1	5	D1	10.1																				0	0
8-19-75	22	2	3	2	9	D1	10.0																				0	0
8-19-75	22	1	9	3	5	D1	17.8																				0	0
8-19-75	22	1	3	1	5	D2	10.6																				0	23
8-19-75	22	2	3	2	9	D2	10.5																				0	0

Appendix 1. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	Dl	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
8-19-75	22	1	9	3	5	D2	18.0																				0	0
8-19-75	22	2	3	1	5	LN	10.4																				0	0
8-19-75	22	2	3	2	9	LN	10.4																				0	0
8-19-75	22	2	9	3	5	LN	17.4																				0	0
8-20-75	22	1	3	1	5	D1	10.0																				0	0
8-20-75	22	2	3	2	9	D1	10.4																				0	0
8-20-75	22	1	9	3	5	D1	18.0																				0	0
8-20-75	22	1	3	1	5	D2	10.2																				0	0
8-20-75	22	2	3	2	9	D2	10.5																				0	0
8-20-75	22	1	9	3	5	D2	18.2																				0	0
8-20-75	22	1	3	1	5	N1	13.7																				0	36
8-20-75	22	2	3	2	9	N1	13.9																				0	0
8-20-75	22	1	9	3	5	N1	21.1																				0	0
8-20-75	22	1	3	1	5	N2	12.5																				0	0
8-20-75	22	2	3	2	9	N2	12.4			15																	15	0
8-20-75	22	1	9	3	5	N2	20.0																				0	0
8-21-75	22	2	3	1	5	LD	13.0	7																			7	0
8-21-75	22	2	3	2	9	LD	13.0																				0	0
8-21-75	22	2	9	3	5	LD	20.4																				0	0
8-26-75	23	1	3	1	5	D2	22.5																				0	0
8-26-75	23	2	3	2	9	D2	22.8	22																			22	0
8-26-75	23	1	9	3	5	D2	22.7																				0	0
8-26-75	23	1	3	1	5	N1	22.5																				0	0
8-26-75	23	2	3	2	9	N1	22.7																				0	0
8-26-75	23	1	9	3	5	N1	22.7			90																	90	0
8-26-75	23	1	3	1	5	N2	22.7																				0	0
8-26-75	23	2	3	2	9	N2	22.0																				0	0
8-26-75	23	1	9	3	5	N2	22.7																				0	0
8-27-75	23	1	3	1	5	D1	23.3																				0	0
8-27-75	23	2	3	2	9	D1	23.3																				0	0
8-27-75	23	1	9	3	5	D1	23.3																				0	0
8-27-75	23	1	3	1	5	D2	23.0																				0	0
8-27-75	23	2	3	2	9	D2	23.4																				0	0
8-27-75	23	1	9	3	5	D2	23.3			15																	15	0
8-27-75	23	2	3	1	5	LN	22.8	10																			10	0
8-27-75	23	2	3	2	9	LN	22.8	20					10														30	10
8-27-75	23	2	9	3	5	LN	23.3																				0	0
8-28-75	23	2	3	1	5	LD	20.0	7																			7	0
8-28-75	23	2	3	2	9	LD	20.0																				0	0
8-28-75	23	2	9	3	5	LD	29.6																				0	8
9-02-75	24	1	3	1	5	D2	18.8																				0	0
9-02-75	24	2	3	2	9	D2	18.9																				0	0
9-02-75	24	1	9	3	5	D2	26.5																				0	0
9-02-75	24	1	3	1	5	N1	18.5																				0	0
9-02-75	24	2	3	2	9	N1	18.5																				0	0
9-02-75	24	1	9	3	5	N1	26.0																				0	0

Appendix 1. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	Dl	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
9-02-75	24	1	3	1	5	N2	18.5																				0	0
9-02-75	24	2	3	2	9	N2	18.5																				0	0
9-02-75	24	1	9	3	5	N2	26.3																				0	11
9-03-75	24	1	3	1	5	D1	18.7																				0	0
9-03-75	24	2	3	2	9	D1	18.8																				0	0
9-03-75	24	1	9	3	5	D1	26.7																				0	0
9-08-75	25	1	3	1	5	N2	19.6																				0	0
9-08-75	25	1	9	3	5	N1	28.7	22						22													44	0
9-08-75	25	1	9	3	5	N2	28.2																				0	0
9-09-75	25	1	3	1	5	D1	19.4																				0	0
9-09-75	25	1	3	1	5	D2	19.6					12															12	0
9-09-75	25	1	9	3	5	D1	28.3																				0	0
9-09-75	25	1	9	3	5	D2	28.5																				0	0
10-16-75	26	1	3	3	5	D2	16.0																				0	0
10-16-75	26	1	3	3	5	D2	16.0																				0	0
10-16-75	26	2	3	3	5	LN	14.0					6															6	0
10-16-75	26	2	3	3	5	LN	14.0					6															6	0
10-22-75	27	1	3	1	5	N1	14.4					46															46	0
10-22-75	27	1	3	1	5	N2	14.4					12															12	0
10-22-75	27	3	9	3	5	N1	22.9																				0	0
10-22-75	27	1	9	3	5	N2	23.0					11															11	0
10-22-75	27	1	3	2	5	N1	14.4																				0	0
10-22-75	27	1	3	2	5	N2	14.5																				0	0
10-23-75	27	1	3	1	5	D1	14.5																				0	0
10-23-75	27	1	3	1	5	D2	14.5																				0	0
10-23-75	27	1	9	3	5	D1	22.9																				0	0
10-23-75	27	1	9	3	5	D2	23.7																				0	0
10-23-75	27	1	3	2	5	D1	14.6																				0	0
10-23-75	27	1	3	2	5	D2	14.6																				0	0
11-05-75	28	1	3	3	5	N1	12.5																				0	0
11-05-75	28	3	3	3	5	N1	12.5																				0	0
11-05-75	28	1	9	3	5	N1	12.5																				0	0
11-06-75	28	2	3	3	5	LN	11.8																				0	0
11-06-75	28	2	3	3	5	LN	11.8																				0	0
11-06-75	28	2	9	3	5	LN	11.8																				0	0
11-06-75	28	1	3	3	5	D2	12.2																				0	0
11-06-75	28	1	9	3	5	D2	13.0																				0	0
11-12-75	29	2	3	3	5	LD	9.5																				0	0
11-12-75	29	2	3	3	5	LD	9.5																				0	0
11-12-75	29	2	9	3	5	LD	10.0																				0	0
11-17-75	30	1	3	1	5	N1	10.2																				0	0
11-17-75	30	1	9	3	5	N1	19.0																				0	0

Appendix 1. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	D1	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
11-17-75	30	1	3	2	5	N1	10.2																				0	0
11-18-75	30	1	3	2	5	D2	9.9																				0	0
11-18-75	30	1	3	1	5	N2	10.1																				0	0
11-18-75	30	1	3	1	5	D1	9.9																				0	0
11-18-75	30	1	3	1	5	D2	9.9																				0	0
11-18-75	30	1	9	3	5	N2	18.8																				0	0
11-18-75	30	1	9	3	5	D1	18.8																				0	0
11-18-75	30	1	3	2	5	N2	10.1																				0	0
11-18-75	30	1	3	2	5	D1	10.0																				0	0
12-08-75	31	1	3	3	5	D2	6.5																				0	0
12-08-75	31	1	3	3	5	D2	6.5																				0	0
12-08-75	31	1	9	3	5	N1	13.7																				0	0
12-08-75	31	1	3	3	5	N1	5.0																				0	0
12-08-75	31	1	3	3	5	N1	5.0																				0	0
12-09-75	31	1	9	3	5	N2	15.0																				0	0
12-09-75	31	1	3	3	5	N2	6.4																				0	0
12-09-75	31	1	3	3	5	N2	6.4																				0	0
12-09-75	31	1	9	3	5	D1	14.0																				0	0
12-09-75	31	1	3	3	5	D1	5.4																				0	0
12-09-75	31	1	3	3	5	D1	5.2																				0	0
12-10-75	31	1	3	2	5	N1	5.0																				0	0
12-10-75	31	1	3	1	5	N1	5.4																				0	0
12-10-75	31	1	9	3	5	N1	15.4																				0	0
12-11-75	31	1	3	2	5	N2	5.4																				0	0
12-11-75	31	1	3	2	5	D1	5.8																				0	0
12-11-75	31	1	3	2	5	D2	6.5																				0	0
12-11-75	31	1	3	1	5	N2	5.7																				0	0
12-11-75	31	1	3	1	5	D1	6.0																				0	0
12-11-75	31	1	3	1	5	D2	6.3																				0	0
12-11-75	31	1	9	3	5	N2	16.6																				0	0
12-11-75	31	1	9	3	5	D1	16.6																				0	0
12-11-75	31	1	9	3	5	D2	16.9																				0	0
12-29-75	32	1	3	2	5	D2	3.4																				0	0
12-29-75	32	1	3	1	5	D2	3.2																				0	0
12-29-75	32	1	9	3	5	D2	14.2																				0	0
12-29-75	32	1	3	2	5	N1	3.0																				0	0
12-29-75	32	1	3	1	5	N1	1.5																				0	0
12-29-75	32	1	9	3	5	N1	14.0																				0	0
12-29-75	32	1	3	2	5	N2	3.8																				0	0
12-30-75	32	1	3	1	5	N2	4.0																				0	0
12-30-75	32	1	9	3	5	N2	14.5																				0	0
12-30-75	32	1	3	2	5	D1	3.1																				0	0
12-30-75	32	1	3	1	5	D1	3.0																				0	0

Appendix 2. Densities (no./1,000 m³) for fish eggs and larvae entrained at the D. C. Cook Plant, southeastern Lake Michigan, 1976. Sample parameter codes are: Mpd (month period): consecutive number of the sample period during the annual sample program. Ser (series): (1) standard series, (2) supplemental sample, (3) problems-sample not used in calculations. Grt (grate): location of forebay grate, see Fig. 3 for reference. N/S (north/south): further designation of sampling location at each grate, (1) north, (2) south, (3) no designation, see Fig. 3 for reference. Dpt (depth): depth (m) of sampling in the forebay. Dl (diel): (N1) midnight to dawn, (D1) dawn to noon, (D2) noon to dusk, (N2) dusk to midnight. (LD and LN) long day or long night, samples extending beyond normal diel schedule. (OD and ON) other day or other night, sampling was performed at irregular intervals. Temp: temperature (C) of intake water when the sample was collected. Refer to Table 1 for species designation. Blank entries indicate zero densities.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	Dl	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
1-13-76	1	1	3	2	5	N1	2.0																				0	0
1-13-76	1	1	3	1	5	N1	2.0																				0	0
1-13-76	1	1	9	3	5	N1	2.0																				0	0
1-13-76	1	2	3	2	5	N2	1.7																				0	0
1-14-76	1	2	3	1	5	N2	1.6																				0	0
1-14-76	1	1	9	3	5	N2	1.6																				0	0
1-14-76	1	1	3	1	5	D1	2.6																				0	0
1-14-76	1	1	9	3	5	D1	2.6																				0	0
1-14-76	1	1	3	2	5	D2	2.8																				0	0
1-14-76	1	1	3	1	5	D2	2.9																				0	0
1-14-76	1	1	9	3	5	D2	2.8																				0	0
1-27-76	2	3	3	2	5	D2	1.0																				0	0
1-27-76	2	3	3	1	5	D2	1.0																				0	0
1-27-76	2	1	9	3	5	D2	1.0																				0	17
1-27-76	2	1	3	2	5	N1	1.0																				0	372
1-27-76	2	3	3	1	5	N1	1.0																				0	0
1-27-76	2	1	9	3	5	N1	1.0																				0	102
1-28-76	2	1	3	2	5	N2	1.0																				0	0
1-28-76	2	1	9	3	5	N2	1.0																				0	0
1-28-76	2	3	3	2	5	D1	0.5																				0	0
1-28-76	2	1	9	3	5	D1	0.5																				0	0
2-10-76	3	1	3	1	5	N1	1.7																				0	163
2-10-76	3	1	3	2	5	N1	1.5																				0	193
2-10-76	3	1	9	3	5	N1	1.6					14															14	0
2-11-76	3	1	3	1	5	N2	2.0																				0	108
2-11-76	3	1	3	2	5	N2	1.6																				0	30
2-11-76	3	2	9	3	5	N2	1.6																				0	67
2-11-76	3	1	3	1	5	D1	2.3																				0	0
2-11-76	3	1	3	2	5	D1	1.3																				0	151
2-11-76	3	2	9	3	5	D1	1.8																				0	0
2-11-76	3	1	3	1	5	D2	1.0																				0	20
2-11-76	3	1	3	2	5	D2	1.0																				0	17
2-11-76	3	2	9	3	5	D2	1.9																				0	24
2-25-76	4	1	3	3	5	D2	2.5																				0	0
2-25-76	4	1	3	3	5	D2	2.5																				0	0

Appendix 2. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	D1	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
2-25-76	4	2	9	3	5	D2	2.5																				0	0
2-25-76	4	1	3	3	5	N1	2.8																				0	0
2-25-76	4	1	3	3	5	N1	2.8																				0	0
2-25-76	4	1	9	3	5	N1	8.7																				0	0
2-26-76	4	1	3	3	5	N2	2.9																				0	0
2-26-76	4	1	3	3	5	N2	2.9																				0	0
2-26-76	4	1	9	3	5	N2	2.9																				0	0
2-26-76	4	1	3	2	5	D1	3.0																				0	49
2-26-76	4	1	3	1	5	D1	3.0																				0	0
2-26-76	4	1	9	3	5	D1	3.0																				0	0
3-09-76	5	1	3	1	5	N1	4.1																				0	0
3-09-76	5	1	3	2	5	N1	4.3																				0	20
3-09-76	5	1	9	3	5	N1	4.2																				0	0
3-10-76	5	1	3	1	5	N2	3.3																				0	0
3-10-76	5	1	3	2	5	N2	3.5																				0	0
3-10-76	5	1	9	3	5	N2	3.4																				0	0
3-10-76	5	1	3	1	5	D1	3.2																				0	0
3-10-76	5	1	3	2	5	D1	3.5																				0	0
3-10-76	5	1	9	3	5	D1	3.8																				0	0
3-10-76	5	1	3	1	5	D2	3.5																				0	0
3-10-76	5	1	3	2	5	D2	3.9																				0	0
3-10-76	5	1	9	3	5	D2	3.7																				0	0
3-23-76	6	1	3	2	5	N1	5.0							21													21	0
3-23-76	6	1	3	1	5	N1	4.9																				0	0
3-23-76	6	1	9	3	5	N1	5.0																				0	0
3-23-76	6	1	3	2	5	N2	4.9																				0	0
3-23-76	6	1	3	1	5	N2	5.0																				0	0
3-23-76	6	1	9	3	5	N2	5.0																				0	12
3-24-76	6	1	3	2	5	D1	4.5																				0	0
3-24-76	6	1	3	1	5	D1	4.5																				0	0
3-24-76	6	1	9	3	5	D1	4.5																				0	16
3-24-76	6	1	3	2	5	D2	4.2																				0	0
3-24-76	6	1	3	1	5	D2	4.3																				0	0
3-24-76	6	1	9	3	5	D2	4.2																				0	0
4-05-76	7	1	3	1	5	N1	7.4																				0	0
4-05-76	7	1	3	1	5	N1	8.2																				0	0
4-05-76	7	1	3	2	5	N1	7.9																				0	0
4-05-76	7	1	9	3	5	N1	7.8																				0	0
4-06-76	7	1	3	1	5	N2	7.1																				0	0
4-06-76	7	1	3	1	5	N2	7.4																				0	0
4-06-76	7	1	3	2	5	N2	7.7																				0	0
4-06-76	7	1	9	3	5	N2	7.4																				0	0
4-06-76	7	1	3	1	5	D1	6.9																				0	0
4-06-76	7	1	3	1	5	D1	7.0																				0	0
4-06-76	7	1	3	2	5	D1	7.0																				0	0

Appendix 2. Continued.

	Sample parameters							Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	Dl	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
4-06-76	7	1	9	3	5	D1	7.0																				0	0
4-06-76	7	1	3	1	5	D2	6.6																				0	0
4-06-76	7	1	3	1	5	D2	7.0																				0	0
4-06-76	7	1	9	3	5	D2	6.8																				0	0
4-13-76	8	2	3	3	5	LN	9.0																				0	0
4-13-76	8	2	3	3	5	LN	9.0																				0	10
4-13-76	8	2	9	3	5	LN	9.0																				0	0
4-14-76	8	2	3	3	5	LD	9.0																				0	22
4-14-76	8	2	3	3	5	LD	9.0																				0	0
4-14-76	8	2	9	3	5	LD	9.0																				0	8
4-20-76	9	2	3	3	5	LD	7.0																				0	0
4-20-76	9	3	3	3	5	LD	7.0																				0	0
4-20-76	9	2	9	3	5	LD	7.0																				0	0
4-20-76	9	2	3	3	5	LN	7.0			7																	7	0
4-20-76	9	2	3	3	5	LN	7.0																				0	0
4-20-76	9	2	9	3	5	LN	7.0																				0	0
4-28-76	10	1	3	3	5	N1	8.0																				0	0
4-28-76	10	1	3	3	5	N1	8.0			69																	69	46
4-28-76	10	1	9	3	5	N1	8.0			21																	21	42
4-29-76	10	1	3	3	5	N2	7.8																				0	14
4-29-76	10	1	3	3	5	N2	7.7			121																	121	0
4-29-76	10	1	9	3	5	N2	7.8																				0	0
4-29-76	10	1	3	3	5	D1	7.2																				0	0
4-29-76	10	1	3	3	5	D1	7.3														18						18	0
4-29-76	10	1	9	3	5	D1	7.2																				0	0
4-29-76	10	1	3	3	5	D2	7.2																				0	0
4-29-76	10	1	3	3	5	D2	7.2			15																	15	0
4-29-76	10	1	9	3	5	D2	7.2																				0	0
5-05-76	11	2	3	3	5	LD	9.8																				0	31
5-05-76	11	2	3	3	5	LD	9.8																				0	64
5-05-76	11	2	9	3	5	LD	9.8																				0	0
5-05-76	11	2	3	3	5	LN	10.0																				0	56
5-05-76	11	2	3	3	5	LN	10.0																				0	18
5-05-76	11	2	9	3	5	LN	10.5																				0	57
5-11-76	12	1	3	1	5	D2	12.8			24																	24	127
5-11-76	12	1	3	1	5	D2	12.6	7																			7	58
5-11-76	12	1	3	2	5	D2	13.0															10					10	60
5-11-76	12	1	9	3	5	D2	12.8			20																	20	42
5-10-76	12	1	3	1	5	N1	12.2																				0	45
5-10-76	12	1	3	1	5	N1	12.2																				0	23
5-10-76	12	1	3	2	5	N1	12.3																				0	0
5-10-76	12	1	9	3	5	N1	12.2																				0	0
5-10-76	12	1	3	1	5	N2	12.4																				0	0

Appendix 2. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	D1	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
5-10-76	12	1	3	1	5	N2	12.2																				0	0
5-10-76	12	1	3	2	5	N2	12.4																				0	0
5-10-76	12	1	9	3	5	N2	12.4																				0	14
5-11-76	12	1	3	1	5	D1	12.6																				0	25
5-11-76	12	1	3	1	5	D1	12.2	12														24					36	49
5-11-76	12	1	3	2	5	D1	12.6																				0	0
5-11-76	12	1	9	3	5	D1	12.5																				0	19
5-26-76	13	1	3	3	5	N1	11.0																				0	0
5-26-76	13	1	3	3	5	N1	11.0																				0	0
5-26-76	13	1	9	3	5	N1	21.0																				0	0
5-27-76	13	1	3	3	5	N2	11.0																				0	0
5-27-76	13	1	3	3	5	N2	11.0																				0	20
5-27-76	13	1	9	3	5	N2	11.0																				0	0
5-27-76	13	1	3	3	5	D1	12.4																				0	0
5-27-76	13	1	3	3	5	D1	12.4																				0	29
5-27-76	13	1	9	3	5	D1	12.4																				0	0
5-27-76	13	1	3	3	5	D2	12.4	11						11													22	11
5-27-76	13	1	9	3	5	D2	12.4																				0	7
6-03-76	14	1	3	1	5	N1	11.3																				0	0
6-03-76	14	1	3	2	5	N1	11.2																				0	18
6-03-76	14	1	9	3	5	N1	11.2																				0	133
6-04-76	14	1	3	1	5	N2	11.1																				0	135
6-04-76	14	1	3	2	5	N2	11.1																				0	71
6-04-76	14	1	9	3	5	N2	11.1																				0	233
6-04-76	14	1	3	1	5	D1	11.4																				0	87
6-04-76	14	1	3	2	5	D1	11.3																				0	62
6-04-76	14	1	9	3	5	D1	11.4	10																			10	31
6-04-76	14	1	3	1	5	D2	11.7																				0	191
6-04-76	14	1	3	2	5	D2	11.8																				0	35
6-04-76	14	1	9	3	5	D2	11.8	10																			10	87
6-10-76	15	1	3	2	5	D2	19.2	13																			13	2650
6-10-76	15	1	3	1	5	D2	19.2	52																			52	3568
6-10-76	15	1	9	3	5	D2	19.2	45																			45	4098
6-10-76	15	1	3	2	5	N1	19.3							130													130	8649
6-10-76	15	1	3	1	5	N1	19.2	28																			28	8354
6-10-76	15	1	9	3	5	N1	19.2	48																			48	7448
6-11-76	15	1	3	2	5	N2	19.0																				0	5900
6-11-76	15	1	3	1	5	N2	19.0																			21	21	10657
6-11-76	15	1	9	3	5	N2	19.0	144																			144	7956
6-11-76	15	1	3	2	5	D1	19.3	70																			70	8603
6-11-76	15	1	3	1	5	D1	19.2	54																			54	2621
6-11-76	15	1	9	3	5	D1	19.2	9																			9	2581
6-14-76	16	1	3	2	5	N1	20.0	1019																			1019	11019
6-14-76	16	1	3	1	5	N1	20.4	144								144											288	11146

Appendix 2. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	Dl	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
6-14-76	16	1	9	3	5	N1	20.2	192								38						38					268	14563
6-14-76	16	1	3	2	5	N2	19.9	138							17												155	10737
6-14-76	16	1	3	1	5	N2	20.1	44																			44	15337
6-14-76	16	1	9	3	5	N2	20.0	37								12											49	2924
6-15-76	16	1	3	2	5	D1	19.8	90																			90	3619
6-15-76	16	1	3	1	5	D1	20.0	107																			107	3448
6-15-76	16	1	9	3	5	D1	19.9	13																			13	427
6-15-76	16	1	3	2	5	D2	19.7	96																			96	2054
6-15-76	16	1	3	1	5	D2	19.9	80			13																93	1740
6-15-76	16	1	9	3	5	D2	19.8	49																			49	1859
6-15-76	16	1	3	2	5	N1	19.6	276						12			12										300	4796
6-15-76	16	1	3	1	5	N1	19.6	667	13						13	13											706	7369
6-15-76	16	1	9	3	5	N1	19.6	14																			14	686
6-16-76	16	1	3	2	5	D1	19.5	32																			32	3682
6-16-76	16	1	3	1	5	D1	19.5	570																			570	15071
6-16-76	16	1	9	3	5	D1	19.5	1112	10					30													1152	6671
6-22-76	17	1	9	3	5	D2	16.2																				0	1372
6-22-76	17	1	3	1	5	D2	16.2	15																			15	207
6-22-76	17	1	3	2	5	D2	16.3	16																			16	369
6-22-76	17	1	9	3	5	N1	17.2																				0	34037
6-22-76	17	1	3	1	5	N1	17.2	19																			19	6809
6-22-76	17	1	3	2	5	N1	17.3	80	20																		100	16095
6-23-76	17	1	9	3	5	N2	17.0																				0	3431
6-23-76	17	1	3	1	5	N2	17.0																				0	4723
6-23-76	17	1	3	2	5	N2	17.0																				0	2771
6-23-76	17	1	9	3	5	D1	17.2	10																			10	1235
6-23-76	17	1	3	1	5	D1	17.2							15													15	8093
6-23-76	17	1	3	2	5	D1	17.2																				0	697
6-29-76	18	1	9	3	5	D1	21.0																				0	1831
6-29-76	18	1	3	1	5	D1	21.0							25													25	888
6-29-76	18	1	3	2	5	D1	21.0	36																			36	1040
6-29-76	18	1	9	3	5	D2	20.5																				0	413
6-29-76	18	1	3	1	5	D2	20.5	28																			28	1034
6-29-76	18	1	3	2	5	D2	20.5																				0	94
6-29-76	18	1	9	3	5	N1	19.8																				0	15248
6-29-76	18	1	3	1	5	N1	20.0																				0	591
6-29-76	18	1	3	2	5	N1	19.7	292	52					160													504	15585
6-30-76	18	1	9	3	5	N2	19.8																				0	43109
6-30-76	18	1	3	1	5	N2	19.8	76						50													126	36201
6-30-76	18	1	3	2	5	N2	19.5	48																			48	4276
7-06-76	19	1	9	3	5	D2	19.8																				0	21
7-06-76	19	1	3	1	5	D2	19.7	13																			13	2495
7-06-76	19	1	3	2	5	D2	19.8	56																			56	871
7-06-76	19	1	9	3	5	N1	19.8																				0	18424
7-06-76	19	1	3	1	5	N1	19.7	26																			26	53231

Appendix 2. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	D1	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
7-06-76	19	1	3	2	5	N1	19.8	44						22													66	48501
7-07-76	19	1	9	3	5	N2	20.0																				0	35578
7-07-76	19	1	3	1	5	N2	20.0	28																			28	18906
7-07-76	19	1	3	2	5	N2	20.0																				0	9695
7-07-76	19	1	9	3	5	D1	20.5																				0	17018
7-07-76	19	1	3	1	5	D1	20.5	25																			25	4221
7-07-76	19	1	3	2	5	D1	20.5	34																			34	3618
7-12-76	20	1	3	2	5	N1	17.5	1243	37																		1280	14888
7-12-76	20	1	3	1	5	N1	16.8	1043																			1043	16278
7-12-76	20	1	9	3	5	N1	17.2	420																			420	12099
7-12-76	20	1	3	2	5	N2	14.8	373		45			184														602	8919
7-12-76	20	1	3	1	5	N2	14.1	80					64	147													291	9855
7-12-76	20	1	9	3	5	N2	14.4	36																			36	2754
7-13-76	20	1	3	2	5	D1	14.5	343																			343	5094
7-13-76	20	1	3	1	5	D1	14.3																				0	7489
7-13-76	20	1	9	3	5	D1	14.4	21																			21	1756
7-13-76	20	1	3	2	5	D2	16.2	239					9														248	1171
7-13-76	20	1	3	1	5	D2	15.8	124																			124	568
7-13-76	20	1	2	3	5	D2	16.0	132																			132	610
7-13-76	20	1	9	3	5	D2	16.0	135							8												143	970
7-13-76	20	2	3	2	5	LN	19.3	111						20													131	18066
7-13-76	20	2	3	1	5	LN	19.3	169	12					12													193	27481
7-13-76	20	2	2	3	5	LN	19.3	191																			191	20064
7-13-76	20	2	9	3	5	LN	19.3	72																			72	34239
7-14-76	20	2	3	2	5	LD	20.2	31																			31	2464
7-14-76	20	2	3	1	5	LD	20.2	83																			83	3213
7-14-76	20	2	2	3	5	LD	20.1	42																			42	5487
7-14-76	20	2	9	3	5	LD	20.2	16																			16	2528
7-14-76	20	2	9	3	5	LN	21.6	81																			81	14424
7-14-76	20	2	3	1	5	LN	21.5	561																			561	40063
7-14-76	20	2	2	3	5	LN	21.6	389																			389	11276
7-14-76	20	2	3	2	5	LN	21.6	273						6													279	15495
7-15-76	20	2	3	2	5	LD	22.3	6																			6	5595
7-15-76	20	2	3	1	5	LD	22.2	50																			50	2187
7-15-76	20	2	2	3	5	LD	22.3	36																			36	2086
7-15-76	20	2	9	3	5	LD	22.3																				0	595
7-15-76	20	2	3	2	5	LN	22.7	385	14								14										413	79535
7-15-76	20	2	3	1	5	LN	22.8	965						54													1019	71345
7-15-76	20	2	2	3	5	LN	22.7	162						9													171	15215
7-15-76	20	2	9	3	5	LN	22.7	7																			7	6391
7-16-76	20	1	3	2	5	D1	22.8	227	13																		240	256206
7-16-76	20	1	3	1	5	D1	22.7	1946	28					42													2016	34805
7-16-76	20	1	2	3	5	D1	22.8	1261	58																		1319	22903
7-16-76	20	1	9	3	5	D1	22.8	1398			14																1412	42269
7-20-76	21	1	3	1	5	D2	23.3	1456						410													1866	1150
7-20-76	21	1	3	1	5	D2	23.4	1181																			1181	296

Appendix 2. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	Dl	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
7-20-76	21	1	2	3	5	D2	23.3	113						16													129	410
7-20-76	21	1	9	3	5	D2	23.3	269																			269	1463
7-20-76	21	1	3	2	5	N1	23.3	2050	50																		2100	3196
7-20-76	21	1	3	1	5	N1	23.4	2711	31																		2742	2749
7-20-76	21	1	2	3	5	N1	23.3	2060						31			31										2122	3416
7-20-76	21	1	9	3	5	N1	23.3	220						66													286	1376
7-21-76	21	1	3	2	5	N2	23.5	2566																			2566	5903
7-20-76	21	1	3	1	5	N2	23.5	967						126													1093	10313
7-20-76	21	1	2	3	5	N2	23.5	1379																			1379	5712
7-20-76	21	1	9	3	5	N2	23.5	254																			254	3535
7-21-76	21	1	3	2	5	D1	23.5	251																			251	1156
7-21-76	21	1	3	1	5	D1	23.5	786																			786	1710
7-21-76	21	1	2	3	5	D1	23.5	269																			269	2000
7-21-76	21	1	9	3	5	D1	23.5	95																			95	1436
7-27-76	22	1	3	2	5	N1	23.7	768				16															784	15843
7-27-76	22	1	3	1	5	N1	23.8	420	68																		488	8365
7-27-76	22	1	2	3	5	N1	23.7	546	17			17															580	9251
7-27-76	22	1	9	3	5	N1	23.7	86				14															100	4264
7-28-76	22	1	3	2	5	N2	23.5	535																			535	147792
7-28-76	22	1	3	1	5	N2	23.5	301						40													341	56780
7-28-76	22	1	2	3	5	N2	23.5	168																			168	11025
7-28-76	22	1	9	3	5	N2	23.5	90	18																		108	22027
7-28-76	22	1	3	2	5	D1	23.5	194																			194	8632
7-28-76	22	1	3	1	5	D1	23.5	34																			34	17363
7-28-76	22	1	2	3	5	D1	23.5	34																			34	1014
7-28-76	22	1	9	3	5	D1	23.5	33																			33	15967
7-28-76	22	3	3	2	5	D2	23.5	1320																			1320	56010
7-28-76	22	1	3	1	5	D2	24.0	85						7													92	8717
7-28-76	22	1	2	3	5	D2	23.5							16													16	230
7-28-76	22	1	9	3	5	D2	23.7	72																			72	1123
7-28-76	22	1	3	2	5	N1	24.5	281						107													388	9407
7-28-76	22	1	3	1	5	N1	24.5	196						169													365	12316
7-28-76	22	1	2	3	5	N1	24.5	250																			250	7953
7-28-76	22	1	9	3	5	N1	24.5	54																			54	6344
8-03-76	23	3	3	2	5	N1	21.9																				0	252
8-03-76	23	1	3	1	5	N1	21.5	437																			437	93
8-03-76	23	3	2	3	5	N1	21.8	257																			257	3341
8-03-76	23	1	9	3	5	N1	21.7	244																			244	135
8-04-76	23	3	3	2	5	N2	21.8	270																			270	181
8-04-76	23	1	3	1	5	N2	21.8	253																			253	102
8-04-76	23	3	2	3	5	N2	21.9	243																			243	327
8-04-76	23	1	9	3	5	N2	21.8	48																			48	145
8-04-76	23	1	3	2	5	D1	22.2																				0	15
8-04-76	23	1	3	1	5	D1	22.1	13																			13	40
8-04-76	23	1	2	3	5	D1	22.2	52																			52	27
8-04-76	23	1	9	3	5	D1	22.2	24																			24	0

Appendix 2. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	D1	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
8-04-76	23	1	3	2	5	D2	22.2	19																			19	19
8-04-76	23	1	3	1	5	D2	22.1	96																			96	0
8-04-76	23	1	2	3	5	D2	22.2	64																			64	0
8-04-76	23	1	9	3	5	D2	22.2	14																			14	0
8-04-76	23	1	9	3	5	N1	22.3	405	81																		486	82
8-04-76	23	1	3	2	5	N1	22.3	239																			239	0
8-04-76	23	1	3	1	5	N1	22.4	217						245			27										489	0
8-04-76	23	1	2	3	5	N1	22.2	588	56																		644	28
8-05-76	23	1	3	2	5	N2	22.6	60	20																		80	500
8-05-76	23	1	3	1	5	N2	22.6	90						18													108	235
8-05-76	23	1	2	3	5	N2	22.6	184																			184	540
8-05-76	23	1	9	3	5	N2	22.6	114						16													130	33
8-09-76	24	1	3	2	5	N1	21.6																				0	48
8-09-76	24	1	3	1	5	N1	21.6																				0	0
8-09-76	24	1	2	3	5	N1	21.6																				0	0
8-09-76	24	1	9	3	5	N1	21.0							43													43	0
8-09-76	24	1	3	2	5	N2	20.6	14	14																		28	44
8-09-76	24	1	3	1	5	N2	20.6	140																			140	389
8-09-76	24	1	2	3	5	N2	20.5	39																			39	281
8-09-76	24	1	9	3	5	N2	20.6	105																			105	270
8-10-76	24	1	3	2	5	D1	20.5																				0	22
8-10-76	24	1	3	1	5	D1	20.6	25																			25	25
8-10-76	24	1	2	3	5	D1	20.4	21																			21	301
8-10-76	24	1	9	3	5	D1	20.5	22																			22	45
8-10-76	24	1	3	2	5	D2	21.4																				0	12
8-10-76	24	1	3	1	5	D2	21.4	55																			55	11
8-10-76	24	1	2	3	5	D2	21.4	11																			11	0
8-10-76	24	1	9	3	5	D2	21.4	22																			22	11
8-10-76	24	2	3	2	5	LN	20.9	56																			56	84
8-10-76	24	2	3	1	5	LN	21.9	55																			55	153
8-10-76	24	2	2	3	5	LN	21.9	75						8													83	26
8-10-76	24	2	9	3	5	LN	21.6	81																			81	110
8-11-76	24	2	3	2	5	LD	22.0	8																			8	35
8-11-76	24	2	3	1	5	LD	22.0	32																			32	33
8-11-76	24	2	2	3	5	LD	22.0	35																			35	0
8-11-76	24	2	9	3	5	LD	22.0	21																			21	29
8-16-76	25	1	3	2	5	D2	21.7																				0	0
8-16-76	25	1	3	1	5	D2	21.9																				0	0
8-16-76	25	1	2	3	5	D2	22.0																				0	0
8-16-76	25	1	9	3	5	D2	21.9																				0	0
8-16-76	25	1	3	2	5	N1	21.8																				0	0
8-16-76	25	1	3	1	5	N1	22.0																				0	0
8-16-76	25	1	2	3	5	N1	22.0																				0	0
8-16-76	25	1	9	3	5	N1	21.9																				0	0
8-16-76	25	1	3	2	5	N2	21.8																				0	56
8-16-76	25	1	3	1	5	N2	21.8	30																			30	15

Appendix 2. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	D1	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
8-16-76	25	1	2	3	5	N2	22.0	26																			26	0
8-16-76	25	1	9	3	5	N2	21.9	13																			13	0
8-17-76	25	1	3	2	5	D1	21.6																				0	0
8-17-76	25	1	3	1	5	D1	22.0																				0	0
8-17-76	25	1	2	3	5	D1	22.0	18																			18	0
8-17-76	25	1	9	3	5	D1	21.9																				0	0
8-23-76	26	1	3	2	5	N1	22.9																				0	0
8-23-76	26	1	3	1	5	N1	23.0																				0	0
8-23-76	26	1	2	3	5	N1	22.9																				0	0
8-23-76	26	1	9	3	5	N1	22.9							21													21	0
8-24-76	26	1	3	2	5	N2	21.4																				0	0
8-24-76	26	1	3	1	5	N2	21.5	20																			20	0
8-24-76	26	1	2	3	5	N2	21.4	19																			19	0
8-24-76	26	1	9	3	5	N2	21.4																				0	0
8-24-76	26	1	3	2	5	D1	21.0																				0	0
8-24-76	26	1	3	1	5	D1	21.0																				0	0
8-24-76	26	1	2	3	5	D1	21.0																				0	0
8-24-76	26	1	9	3	5	D1	21.0																				0	0
8-24-76	26	1	3	2	5	D2	21.0																				0	0
8-24-76	26	1	3	1	5	D2	21.0																				0	0
8-24-76	26	1	2	3	5	D2	21.0																				0	0
8-24-76	26	1	9	3	5	D2	21.0																				0	0
8-30-76	27	1	3	2	5	N1	21.5																				0	0
8-30-76	27	1	3	1	5	N1	21.5																				0	0
8-30-76	27	1	2	3	5	N1	21.5																				0	0
8-30-76	27	1	9	3	5	N1	21.5																				0	0
8-31-76	27	1	3	2	5	N2	21.5																				0	0
8-31-76	27	1	3	1	5	N2	21.5																				0	0
8-31-76	27	1	2	3	5	N2	21.5		17																		17	0
8-31-76	27	1	9	3	5	N2	21.5																				0	0
8-31-76	27	1	3	2	5	D1	22.0																				0	0
8-31-76	27	1	3	1	5	D1	22.0																				0	0
8-31-76	27	1	2	3	5	D1	22.0																				0	0
8-31-76	27	1	9	3	5	D1	22.0																				0	0
8-31-76	27	1	3	2	5	D2	22.5		13																		13	0
8-31-76	27	1	3	1	5	D2	22.5																				0	0
8-31-76	27	1	2	3	5	D2	22.5																				0	0
8-31-76	27	1	9	3	5	D2	22.5																				0	0
9-14-76	28	1	3	2	5	N1	20.5																				0	0
9-14-76	28	1	3	1	5	N1	20.5																				0	0
9-14-76	28	1	2	3	5	N1	20.5																				0	0
9-14-76	28	1	9	3	5	N1	20.5																				0	0
9-15-76	28	1	3	2	5	N2	20.3																				0	0
9-15-76	28	1	3	1	5	N2	20.3																				0	0
9-15-76	28	1	2	3	5	N2	20.3																				0	0

Appendix 2. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	Dl	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
9-15-76	28	1	9	3	5	N2	20.3																				0	0
9-15-76	28	1	3	2	5	D1	20.5																				0	0
9-15-76	28	1	3	1	5	D1	20.5																				0	0
9-15-76	28	1	2	3	5	D1	20.5																				0	0
9-15-76	28	1	9	3	5	D1	20.5																				0	0
9-15-76	28	1	3	2	5	D2	20.8																				0	0
9-15-76	28	1	3	1	5	D2	20.8																				0	0
9-15-76	28	1	2	3	5	D2	20.8																				0	0
9-15-76	28	1	9	3	5	D2	20.8																				0	0
9-22-76	29	1	3	2	5	N1	18.7																				0	0
9-22-76	29	1	3	1	5	N1	19.1																				0	0
9-22-76	29	1	9	3	5	N1	18.9																				0	0
9-22-76	29	1	3	1	5	N2	18.5	14																			14	0
9-22-76	29	1	3	2	5	N2	18.7																				0	0
9-22-76	29	1	9	3	5	N2	18.6	13				13															26	0
9-23-76	29	1	3	1	5	D1	18.6	27																			27	0
9-23-76	29	1	3	2	5	D1	19.1		25																		25	0
9-23-76	29	3	9	3	5	D1	18.8																				0	0
9-23-76	29	1	3	2	5	D2	19.2																				0	0
9-23-76	29	1	3	1	5	D2	18.9																				0	0
9-23-76	29	1	9	3	5	D2	19.0																				0	0
10-11-76	30	1	3	2	5	N1	16.2																				0	0
10-11-76	30	1	3	1	5	N1	16.0																				0	0
10-11-76	30	1	2	3	5	N1	16.0		22																		22	0
10-11-76	30	1	9	3	5	N1	16.0																				0	0
10-11-76	30	1	3	2	5	N2	16.0																				0	0
10-11-76	30	1	3	1	5	N2	15.3																				0	0
10-11-76	30	1	2	3	5	N2	15.3																				0	0
10-11-76	30	1	9	3	5	N2	15.5																				0	0
10-12-76	30	1	3	2	5	D1	15.9																				0	0
10-12-76	30	1	3	1	5	D1	15.1																				0	0
10-12-76	30	1	2	3	5	D1	15.2																				0	0
10-12-76	30	1	9	3	5	D1	15.4	40																			40	0
10-12-76	30	1	3	2	5	D2	16.1																				0	0
10-12-76	30	1	3	1	5	D2	15.4																				0	0
10-12-76	30	1	2	3	5	D2	15.4																				0	0
10-12-76	30	1	9	3	5	D2	15.6																				0	0
10-20-76	31	3	3	2	5	D2	13.5																				0	0
10-20-76	31	1	3	1	5	D2	13.5																				0	0
10-20-76	31	3	2	3	5	D2	13.5																				0	0
10-20-76	31	1	9	3	5	D2	13.5																				0	0
10-20-76	31	1	3	2	5	N1	13.2																				0	0
10-20-76	31	1	3	1	5	N1	13.2																				0	0
10-20-76	31	1	2	3	5	N1	13.2																				0	0
10-20-76	31	1	9	3	5	N1	13.2																				0	0

Appendix 2. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	D1	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
10-21-76	31	1	3	2	5	N2	13.3																				0	0
10-21-76	31	1	3	1	5	N2	13.3																				0	0
10-21-76	31	1	2	3	5	N2	13.3																				0	0
10-21-76	31	1	9	3	5	N2	13.3																				0	0
10-21-76	31	1	3	2	5	D1	13.0																				0	0
10-21-76	31	1	3	1	5	D1	13.0																				0	0
10-21-76	31	1	2	3	5	D1	13.0																				0	0
10-21-76	31	1	9	3	5	D1	13.0																				0	0
11-08-76	32	1	3	2	5	N1	7.2																				0	0
11-08-76	32	1	3	1	5	N1	7.1																				0	0
11-08-76	32	1	2	3	5	N1	7.1																				0	0
11-08-76	32	1	9	3	5	N1	7.1																				0	0
11-09-76	32	1	3	2	5	N2	7.0																				0	0
11-09-76	32	1	3	1	5	N2	7.0																				0	0
11-09-76	32	1	2	3	5	N2	7.0																				0	0
11-09-76	32	1	9	3	5	N2	7.0																				0	0
11-09-76	32	1	3	2	5	D1	7.0																				0	0
11-09-76	32	1	3	1	5	D1	6.6																				0	0
11-09-76	32	1	2	3	5	D1	6.8																				0	0
11-09-76	32	1	9	3	5	D1	6.8																				0	0
11-09-76	32	1	3	2	5	D2	7.0																				0	0
11-09-76	32	1	3	1	5	D2	6.7																				0	0
11-09-76	32	1	2	3	5	D2	6.8																				0	0
11-09-76	32	1	9	3	5	D2	6.8																				0	0
11-29-76	33	1	3	2	5	N1	2.0																				0	0
11-29-76	33	1	3	1	5	N1	1.7																				0	0
11-29-76	33	1	2	3	5	N1	1.6					15															15	0
11-29-76	33	1	9	3	5	N1	1.8																				0	0
11-30-76	33	1	3	2	5	N2	2.0																				0	0
11-30-76	33	1	3	1	5	N2	2.2																				0	0
11-30-76	33	3	2	3	5	N2	2.0																				0	0
11-30-76	33	1	9	3	5	N2	2.1																				0	0
11-30-76	33	1	3	2	5	D1	3.0																				0	0
11-30-76	33	1	3	1	5	D1	3.0																				0	0
11-30-76	33	1	2	3	5	D1	3.0																				0	0
11-30-76	33	1	9	3	5	D1	3.0																				0	0
11-30-76	33	1	3	2	5	D2	3.0																				0	0
11-30-76	33	1	3	1	5	D2	3.0																				0	0
11-30-76	33	1	2	3	5	D2	3.0																				0	19
11-30-76	33	1	9	3	5	D2	3.0																				0	0
12-01-76	33	1	3	2	5	D1	3.9																				0	0
12-01-76	33	1	3	1	5	D1	4.0																				0	0
12-01-76	33	1	2	3	5	D1	3.9																				0	0
12-01-76	33	1	9	3	5	D1	3.9																				0	0
12-01-76	33	1	3	2	5	D2	4.2																				0	0
12-01-76	33	1	3	1	5	D2	4.6																				0	0

Appendix 2. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	D1	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
12-01-76	33	1	2	3	5	D2	4.2																				0	0
12-01-76	33	1	9	3	5	D2	4.3																				0	0
12-01-76	33	1	3	2	5	N1	3.4																				0	0
12-01-76	33	1	3	1	5	N1	3.5																				0	0
12-01-76	33	1	2	3	5	N1	3.4																				0	0
12-01-76	33	1	9	3	5	N1	3.4																				0	0
12-02-76	33	1	3	2	5	N2	2.6																				0	0
12-02-76	33	1	3	1	5	N2	2.6																				0	0
12-02-76	33	1	2	3	5	N2	2.6																				0	0
12-02-76	33	1	9	3	5	N2	2.6																				0	0
12-15-76	34	1	3	1	5	N1	3.4																				0	0
12-15-76	34	1	3	1	5	N1	3.4																				0	0
12-15-76	34	1	9	3	5	N1	3.4																				0	0
12-16-76	34	1	3	1	5	N2	3.8																				0	0
12-16-76	34	1	3	1	5	N2	3.6																				0	0
12-16-76	34	1	9	3	5	N2	3.7																				0	0
12-16-76	34	1	3	1	5	D1	4.2																				0	0
12-16-76	34	1	3	1	5	D1	4.0																				0	0
12-16-76	34	1	9	3	5	D1	4.1																				0	0
12-16-76	34	1	3	1	5	D2	2.2																				0	0
12-16-76	34	1	3	1	5	D2	2.2																				0	0
12-16-76	34	1	9	3	5	D2	2.2																				0	0
12-29-76	35	1	3	2	5	D2	1.0																				0	0
12-29-76	35	1	3	1	5	D2	1.0																				0	0
12-29-76	35	1	9	3	5	D2	1.0																				0	0
12-29-76	35	1	3	2	5	N1	1.0																				0	0
12-29-76	35	1	3	1	5	N1	1.0																				0	0
12-29-76	35	1	9	3	5	N1	1.0																				0	0
12-30-76	35	1	3	2	5	N2	1.5																				0	0
12-30-76	35	1	3	1	5	N2	1.5																				0	0
12-30-76	35	1	9	3	5	N2	1.5																				0	0
12-30-76	35	1	3	2	5	D1	1.5																				0	0
12-30-76	35	1	3	1	5	D1	1.5																				0	0
12-30-76	35	1	9	3	5	D1	1.5																				0	0

Appendix 3. Densities (no./1,000 m³) for fish eggs and larvae entrained at the D. C. Cook Plant, southeastern Lake Michigan, 1977. Sample parameter codes are: Mpd (month period): consecutive number of the sample period during the annual sample program. Ser (series): (1) standard series, (2) supplemental sample, (3) problems-sample not used in calculations. Grt (grate): location of forebay grate, see Fig. 3 for reference. N/S (north/south): further designation of sampling location at each grate, (1) north, (2) south, (3) no designation, see Fig. 3 for reference. Dpt (depth): depth (m) of sampling in the forebay. Dl (diel): (N1) midnight to dawn, (D1) dawn to noon, (D2) noon to dusk, (N2) dusk to midnight, (LD and LN) long day or long night, samples extending beyond normal diel schedule, (OD and ON) other day or other night, sampling was performed at irregular intervals. Temp: temperature (C) of intake water when the sample was collected. Refer to Table 1 for species designation. Blank entries indicate zero densities.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	Dl	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
3-07-77	1	1	9	3	5	N1	0.9																				0	0
3-07-77	1	1	2	3	5	N1	0.9																				0	0
3-07-77	1	1	3	1	5	N1	0.9																				0	0
3-07-77	1	1	3	2	5	N1	1.0																				0	0
3-08-77	1	1	9	3	5	N2	0.8																				0	0
3-08-77	1	1	2	3	5	N2	0.8																				0	0
3-08-77	1	1	3	1	5	N2	0.8																				0	0
3-08-77	1	1	3	2	5	N2	0.8																				0	0
3-08-77	1	1	9	3	5	D1	0.8																				0	0
3-08-77	1	1	2	3	5	D1	0.8																				0	0
3-08-77	1	1	3	1	5	D1	0.9																				0	0
3-08-77	1	1	3	2	5	D1	0.8																				0	0
3-08-77	1	1	9	3	5	D2	1.0																				0	0
3-08-77	1	1	2	3	5	D2	0.9																				0	0
3-08-77	1	1	3	1	5	D2	1.0																				0	0
3-08-77	1	1	3	2	5	D2	1.0																				0	0
3-29-77	2	1	3	2	5	N1	6.2																				0	0
3-29-77	2	1	3	1	5	N1	6.2																				0	0
3-29-77	2	1	2	3	5	N1	6.2																				0	0
3-29-77	2	1	9	3	5	N1	6.2																				0	0
3-30-77	2	1	3	2	5	N2	6.0																				0	0
3-30-77	2	1	3	1	5	N2	6.2																				0	0
3-30-77	2	1	2	3	5	N2	6.0																				0	0
3-30-77	2	1	9	3	5	N2	6.0																				0	0
3-30-77	2	1	3	2	5	D1	5.9																				0	0
3-30-77	2	1	3	1	5	D1	5.9																				0	0
3-30-77	2	1	2	3	5	D1	5.9																				0	0
3-30-77	2	1	9	3	5	D1	5.9																				0	0
3-30-77	2	1	3	2	5	D2	6.0																				0	0
3-30-77	2	1	3	1	5	D2	6.0																				0	0
3-30-77	2	1	2	3	5	D2	6.0																				0	0
3-30-77	2	1	9	3	5	D2	6.0																				0	0
4-11-77	3	1	3	2	5	N1	7.6																				0	0
4-11-77	3	1	3	1	5	N1	7.8																				0	0
4-11-77	3	3	2	3	5	N1	8.0	219																			219	219
4-11-77	3	1	9	3	5	N1	7.8																				0	31

Appendix 3. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	Dl	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
4-12-77	3	1	3	2	5	N2	7.6																				0	0
4-12-77	3	1	3	1	5	N2	7.4																				0	0
4-12-77	3	1	2	3	5	N2	7.6																				0	0
4-12-77	3	1	9	3	5	N2	7.5																				0	0
4-12-77	3	1	3	2	5	D1	7.4																				0	0
4-12-77	3	1	3	1	5	D1	7.4																18				18	0
4-12-77	3	1	2	3	5	D1	7.4																				0	0
4-12-77	3	1	9	3	5	D1	7.4																				0	0
4-12-77	3	1	3	2	5	D2	7.6																				0	0
4-12-77	3	1	3	1	5	D2	7.6																				0	14
4-12-77	3	1	2	3	5	D2	7.7																				0	0
4-12-77	3	1	9	3	5	D2	7.6																				0	0
4-27-77	4	1	3	2	5	D2	9.3																				0	0
4-27-77	4	1	3	1	5	D2	9.3																				0	0
4-27-77	4	1	2	3	5	D2	9.3																				0	0
4-27-77	4	1	9	3	5	D2	9.3																				0	0
4-27-77	4	1	3	2	5	N1	10.1																				0	0
4-27-77	4	1	3	1	5	N1	10.1																				0	0
4-27-77	4	1	2	3	5	N1	10.1																				0	0
4-27-77	4	1	9	3	5	N1	10.1																				0	0
4-28-77	4	1	3	2	5	N2	10.6			16																	16	67
4-28-77	4	1	3	1	5	N2	10.6																				0	158
4-28-77	4	1	2	3	5	N2	10.6																				0	357
4-28-77	4	1	9	3	5	N2	10.6	30																			30	75
4-28-77	4	1	3	2	5	D1	10.8																	23			23	0
4-28-77	4	1	3	1	5	D1	10.8													17							17	141
4-28-77	4	1	2	3	5	D1	10.8																			24	24	269
4-28-77	4	1	9	3	5	D1	10.8																				0	329
5-16-77	5	1	3	2	5	N1	14.0																				0	0
5-16-77	5	1	3	1	5	N1	14.2																				0	0
5-16-77	5	1	2	3	5	N1	14.2																				0	0
5-16-77	5	1	9	3	5	N1	14.1																				0	0
5-16-77	5	1	3	2	5	N2	13.8																				0	0
5-16-77	5	1	3	1	5	N2	14.2																				0	0
5-16-77	5	1	2	3	5	N2	14.2																				0	0
5-17-77	5	1	3	2	5	D1	13.8																				0	0
5-17-77	5	1	3	1	5	D1	13.8																				0	0
5-17-77	5	1	2	3	5	D1	13.7																				0	0
5-17-77	5	1	9	3	5	D1	13.8																				0	0
5-17-77	5	1	3	2	5	D2	14.0																				0	11
5-17-77	5	1	3	1	5	D2	14.0																				0	0
5-17-77	5	1	2	3	5	D2	14.4																				0	0
5-17-77	5	1	9	3	5	D2	14.1																				0	0
5-18-77	5	2	3	2	5	OD	14.9																				0	0
5-18-77	5	2	3	1	5	OD	14.9																				0	0
5-18-77	5	2	2	3	5	OD	15.5																				0	0

Appendix 3. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	Dl	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
5-18-77	5	2	9	3	5	OD	14.9																				0	0
5-19-77	5	2	3	2	5	LD	15.6																				0	0
5-19-77	5	2	3	1	5	LD	15.6																				0	0
5-19-77	5	2	2	3	5	LD	15.6																				0	0
5-19-77	5	2	9	3	5	LD	15.6																				0	0
5-19-77	5	2	3	2	5	LN	15.6																				0	8
5-19-77	5	2	3	1	5	LN	15.6																				0	0
5-19-77	5	2	2	3	5	LN	15.6																				0	0
5-19-77	5	2	9	3	5	LN	15.6																				0	9
5-26-77	6	1	3	2	5	D2	14.7																				0	540
5-26-77	6	1	3	1	5	D2	14.7								13												13	585
5-26-77	6	1	2	3	5	D2	14.7																				0	264
5-26-77	6	1	9	3	5	D2	14.7																				0	336
5-26-77	6	1	3	2	5	N1	10.6				35																35	848
5-26-77	6	1	3	1	5	N1	10.6																				0	1651
5-26-77	6	1	2	3	5	N1	10.6																				0	1938
5-26-77	6	1	9	3	5	N1	10.6																				0	2927
5-27-77	6	1	3	2	5	N2	9.8																				0	376
5-27-77	6	1	3	1	5	N2	9.8																				0	326
5-27-77	6	1	2	3	5	N2	9.8																				0	504
5-27-77	6	1	9	3	5	N2	9.8																				0	343
5-27-77	6	1	3	2	5	D1	10.6	24																			24	49
5-27-77	6	1	3	1	5	D1	10.6																				0	142
5-27-77	6	1	2	3	5	D1	10.6																				0	93
5-27-77	6	1	9	3	5	D1	10.6																				0	251
6-01-77	7	1	3	2	5	D2	13.0																				0	1376
6-01-77	7	1	3	1	5	D2	13.0	34																			34	1582
6-01-77	7	1	2	3	5	D2	13.0	72																			72	2470
6-01-77	7	1	9	3	5	D2	13.0																				0	984
6-01-77	7	1	3	2	5	N1	14.0																				0	140
6-01-77	7	1	3	1	5	N1	14.0																				0	162
6-01-77	7	1	2	3	5	N1	14.0																				0	441
6-01-77	7	1	9	3	5	N1	14.0						39														39	479
6-02-77	7	1	3	2	5	N2	14.6																				0	947
6-02-77	7	1	3	1	5	N2	14.6															16					16	787
6-02-77	7	1	2	3	5	N2	14.6	19	19							19											57	951
6-02-77	7	1	9	3	5	N2	14.6		36													18					54	591
6-02-77	7	1	3	2	5	D1	14.1	77	38		19																134	1944
6-02-77	7	1	3	1	5	D1	14.1	16														16					32	2121
6-02-77	7	1	2	3	5	D1	14.1																				0	2291
6-02-77	7	1	9	3	5	D1	14.1	42																			42	1905
6-07-77	8	1	3	2	5	D2	10.8	11																			11	1180
6-07-77	8	1	3	1	5	D2	10.8						10														10	1023
6-07-77	8	1	2	3	5	D2	10.8																				0	1473
6-07-77	8	1	9	3	5	D2	10.8															13					13	1696

Appendix 3. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	Dl	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
6-07-77	8	1	3	2	5	N1	15.2						42														42	1069
6-07-77	8	1	3	1	5	N1	15.2															36					36	961
6-07-77	8	1	2	3	5	N1	15.2						96														96	2694
6-07-77	8	1	9	3	5	N1	15.2						45														45	1577
6-08-77	8	1	3	2	5	N2	15.6						37														37	1131
6-08-77	8	1	3	1	5	N2	15.6																				0	1046
6-08-77	8	1	2	3	5	N2	15.6																				0	1563
6-08-77	8	1	9	3	5	N2	15.6																				0	2197
6-08-77	8	1	3	2	5	D1	16.0																				0	17811
6-08-77	8	1	3	1	5	D1	16.0																				0	305
6-08-77	8	1	2	3	5	D1	16.0																				0	972
6-08-77	8	1	9	3	5	D1	16.0																				0	687
6-08-77	8	1	3	2	5	D2	16.2				12			12													24	9840
6-08-77	8	1	3	1	5	D2	16.2	10					31														41	36101
6-08-77	8	1	2	3	5	D2	16.2						14														14	59635
6-08-77	8	1	9	3	5	D2	16.2																				0	45668
6-08-77	8	2	3	2	5	LN	15.1		9				9														18	19353
6-08-77	8	2	3	1	5	LN	15.1		8				42			8											58	92315
6-08-77	8	2	2	3	5	LN	15.1		10		10																20	58983
6-08-77	8	2	9	3	5	LN	15.1	57					28			9											94	125343
6-13-77	9	1	3	2	5	N1	15.2	42	126		84																252	6139
6-13-77	9	1	3	1	5	N1	15.1	115			114																229	4854
6-13-77	9	1	2	3	5	N1	15.2		52				52														104	6664
6-13-77	9	1	9	3	5	N1	15.2				106																106	7496
6-13-77	9	1	3	2	5	N2	14.6	45			1743																1788	8026
6-13-77	9	1	3	1	5	N2	14.7		21																		21	6804
6-13-77	9	1	2	3	5	N2	14.2					19															19	8240
6-13-77	9	1	9	3	5	N2	14.5				57																57	8849
6-14-77	9	1	3	2	5	D1	14.2	119																			119	1623
6-14-77	9	1	3	1	5	D1	14.4	21						64													85	1054
6-14-77	9	1	2	3	5	D1	13.6																				0	2134
6-14-77	9	1	9	3	5	D1	14.0	89																			89	1987
6-14-77	9	1	3	2	5	D2	14.8	20			10																30	1275
6-14-77	9	1	3	1	5	D2	14.8	34			34																68	1218
6-14-77	9	1	2	3	5	D2	14.6	14	28																		42	1695
6-14-77	9	1	9	3	5	D2	14.7	12																			12	1181
6-14-77	9	2	3	2	5	LN	14.6																		20		20	1602
6-14-77	9	2	3	1	5	LN	14.6	52	10				31														93	2717
6-14-77	9	2	2	3	5	LN	14.6	12	12																		24	2692
6-14-77	9	2	9	3	5	LN	14.6																				0	2692
6-15-77	9	2	3	2	5	LD	14.7	15																			15	293
6-15-77	9	3	3	1	5	LD	14.2																				0	201
6-15-77	9	2	2	3	5	LD	14.7	18																			18	821
6-15-77	9	2	9	3	5	LD	14.5	17																			17	748
6-15-77	9	2	3	2	5	LN	15.2	14					7														21	4477
6-15-77	9	2	2	3	5	LN	15.2	30					20	10													60	4564
6-15-77	9	2	9	3	5	LN	15.2	42					16														58	4848

Appendix 3. Continued.

	Sample parameters							Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	D1	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
6-16-77	9	2	3	2	5	LD	15.1	29																			29	2217
6-16-77	9	2	2	3	5	LD	15.1	9																			9	1967
6-16-77	9	2	9	3	5	LD	15.1	8																			8	1785
6-21-77	10	1	3	2	5	D2	18.8	242																			242	881
6-21-77	10	1	3	1	5	D2	18.8	122																			122	495
6-21-77	10	1	2	3	5	D2	18.8	131	52	13																	196	751
6-21-77	10	1	9	3	5	D2	18.8	133																			133	524
6-21-77	10	1	3	2	5	N1	18.7	1657	413		69																2139	20264
6-21-77	10	1	3	1	5	N1	18.7	1099	352			39															1490	29954
6-21-77	10	1	2	3	5	N1	18.7	637	467				42														1146	24045
6-21-77	10	1	9	3	5	N1	18.7	1353	511																		1864	18311
6-22-77	10	1	3	2	5	N2	18.2	225	32																		257	5508
6-22-77	10	1	3	1	5	N2	18.2	203	18																		221	8022
6-22-77	10	1	2	3	5	N2	18.2	544	201				20														765	12140
6-22-77	10	1	9	3	5	N2	18.2	561	36																		597	4724
6-22-77	10	1	3	2	5	D1	18.4	226																			226	2079
6-22-77	10	1	3	1	5	D1	18.4	470																			470	4604
6-22-77	10	1	2	3	5	D1	18.4	305																			305	10405
6-22-77	10	1	9	3	5	D1	18.4	135																			135	3086
6-22-77	10	1	3	2	5	D2	17.7	178																			178	588
6-22-77	10	1	3	1	5	D2	17.7	277	39																		316	1059
6-22-77	10	1	2	3	5	D2	17.7	70			14		14												14		112	1740
6-22-77	10	1	9	3	5	D2	17.7	25																			25	985
6-22-77	10	2	3	2	5	LN	17.6	461	207					23													691	14464
6-22-77	10	2	3	1	5	LN	17.6	538	111				36														685	16503
6-22-77	10	2	2	3	5	LN	17.6	609	171				13														793	28962
6-22-77	10	2	9	3	5	LN	17.6	170	218				72	48													508	12666
6-23-77	10	2	3	2	5	LD	19.0	91	6																		97	2274
6-23-77	10	2	3	1	5	LD	19.0	75																			75	3879
6-23-77	10	2	2	3	5	LD	19.0	75	7																		82	2721
6-23-77	10	2	9	3	5	LD	19.0																				0	725
6-28-77	11	1	3	2	5	D2	21.4	133	11																		144	937
6-28-77	11	1	3	1	5	D2	21.4	92	79																		171	710
6-28-77	11	1	2	3	5	D2	21.4	28																			28	889
6-28-77	11	1	9	3	5	D2	21.4	113	45																		158	576
6-28-77	11	1	3	2	5	N1	21.1	72																			72	6211
6-28-77	11	1	3	1	5	N1	21.1	887																			887	5971
6-28-77	11	1	2	3	5	N1	21.1	865																			865	10779
6-28-77	11	1	9	3	5	N1	21.1	1038																			1038	7049
6-29-77	11	1	3	2	5	N2	21.7	275	18				18														311	46157
6-29-77	11	1	3	1	5	N2	21.7	176						22													198	49794
6-29-77	11	1	2	3	5	N2	21.7	115			23		23														161	78384
6-29-77	11	1	9	3	5	N2	21.7	57			38																95	25876
6-29-77	11	1	3	2	5	D1	21.6	174	52																		226	3770
6-29-77	11	1	3	1	5	D1	21.6	105																			105	8934
6-29-77	11	1	2	3	5	D1	21.6	84	42																		126	5805

Appendix 3. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	D1	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
6-29-77	11	1	9	3	5	D1	21.6	74																			74	5720
7-06-77	12	1	3	2	5	D2	23.6	225																			225	477
7-06-77	12	1	3	1	5	D2	23.6	183																			183	456
7-06-77	12	1	2	3	5	D2	23.6																				0	385
7-06-77	12	1	9	3	5	D2	23.6	89																			89	322
7-06-77	12	1	3	2	5	N1	23.0	1580																			1580	5687
7-06-77	12	1	3	1	5	N1	23.0	58	58																		116	465
7-06-77	12	1	2	3	5	N1	23.0	252																			252	1276
7-06-77	12	1	9	3	5	N1	23.0	463		46			46														555	699
7-07-77	12	1	3	2	5	N2	23.0	607	20								20										647	1380
7-07-77	12	1	3	1	5	N2	23.0	484	42				21														547	1056
7-07-77	12	1	2	3	5	N2	23.0	366																			366	2165
7-07-77	12	1	9	3	5	N2	23.0	378					23														401	1310
7-07-77	12	1	3	2	5	D1	22.6	306																			306	510
7-07-77	12	1	3	1	5	D1	22.6	80																			80	54
7-07-77	12	1	2	3	5	D1	22.6	168						24													192	602
7-07-77	12	1	9	3	5	D1	22.6	71																			71	357
7-11-77	13	1	3	2	5	N1	18.1	212																			212	2995
7-11-77	13	1	3	1	5	N1	18.6	449	56				56														561	1581
7-11-77	13	1	2	3	5	N1	18.6	330																			330	4247
7-11-77	13	1	9	3	5	N1	18.6	612																			612	4471
7-11-77	13	1	3	2	5	N2	18.6	615	316																		931	9292
7-11-77	13	1	3	1	5	N2	19.2	748	136					17													901	9319
7-11-77	13	1	2	3	5	N2	19.2	743	233	42				42													1060	16036
7-11-77	13	1	9	3	5	N2	19.0	169																			169	6057
7-12-77	13	1	3	2	5	D1	19.4	280																			280	1443
7-12-77	13	1	3	1	5	D1	20.0	136																			136	0
7-12-77	13	1	2	3	5	D1	19.8	138																			138	4344
7-12-77	13	1	9	3	5	D1	19.7	73																			73	3137
7-12-77	13	1	3	2	5	D2	20.4	30																			30	469
7-12-77	13	1	3	1	5	D2	20.8	103																			103	235
7-12-77	13	1	2	3	5	D2	20.5						14														14	367
7-12-77	13	1	9	3	5	D2	20.6																				0	632
7-12-77	13	2	3	2	5	LN	20.8		8																		8	16030
7-12-77	13	2	3	1	5	LN	21.1	212				10	10	10									20				262	15209
7-18-77	14	1	3	2	5	D2	23.2	245																			245	6755
7-18-77	14	1	3	1	5	D2	23.2	36																			36	1620
7-18-77	14	1	2	3	5	D2	23.2	64																			64	3405
7-18-77	14	1	9	3	5	D2	23.2																				0	1805
7-18-77	14	1	3	2	5	N1	23.7	232	58																		290	5005
7-18-77	14	1	3	1	5	N1	23.7																				0	1854
7-18-77	14	1	2	3	5	N1	23.7	156																			156	631
7-18-77	14	1	9	3	5	N1	23.7	183																			183	490
7-19-77	14	1	3	2	5	N2	23.7	80																			80	4279
7-19-77	14	1	3	1	5	N2	23.7	93																			93	4797

Appendix 3. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	Dl	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
7-19-77	14	1	2	3	5	N2	23.7	136																			136	5038
7-19-77	14	1	9	3	5	N2	23.7	19						19													38	4328
7-19-77	14	1	3	2	5	D1	23.5																				0	425
7-19-77	14	1	3	1	5	D1	23.5																				0	895
7-19-77	14	1	2	3	5	D1	23.5	48						24													72	2232
7-19-77	14	1	9	3	5	D1	23.5																				0	615
7-26-77	15	1	3	2	5	N1	9.5																				0	27
7-26-77	15	1	3	1	5	N1	9.5	14					14														28	115
7-26-77	15	1	2	3	5	N1	9.5				18																18	168
7-26-77	15	1	9	3	5	N1	9.5																				0	40
7-27-77	15	1	3	2	5	N2	12.0	20																			20	367
7-27-77	15	1	3	1	5	N2	12.0	60																			60	121
7-27-77	15	1	2	3	5	N2	12.0	25																			25	178
7-27-77	15	1	9	3	5	N2	12.0			19																	19	114
7-27-77	15	1	3	2	5	D1	14.8	32																			32	82
7-27-77	15	1	3	1	5	D1	14.8	16																			16	0
7-27-77	15	1	2	3	5	D1	14.8																				0	64
7-27-77	15	1	9	3	5	D1	14.8																				0	0
7-27-77	15	1	3	2	5	D2	15.4	23																			23	23
7-27-77	15	1	3	1	5	D2	15.4	24																			24	0
7-27-77	15	1	2	3	5	D2	15.4																				0	29
7-27-77	15	1	9	3	5	D2	15.4																				0	45
8-02-77	16	1	3	2	5	D2	22.0	15																			15	0
8-02-77	16	1	3	1	5	D2	22.0	32																			32	0
8-02-77	16	1	2	3	5	D2	22.0	68																			68	17
8-02-77	16	1	9	3	5	D2	22.0																				0	0
8-02-77	16	1	3	2	5	N1	22.0	182																			182	0
8-02-77	16	1	3	1	5	N1	22.0	153																			153	0
8-02-77	16	1	2	3	5	N1	22.0	362																			362	0
8-02-77	16	1	9	3	5	N1	22.0	202						40													242	40
8-03-77	16	1	3	2	5	N2	21.9	36						12													48	0
8-03-77	16	1	3	1	5	N2	21.9	79																			79	41
8-03-77	16	1	2	3	5	N2	21.9	16																			16	84
8-03-77	16	1	9	3	5	N2	21.9	174																			174	136
8-03-77	16	1	3	2	5	D1	21.9	119																			119	0
8-03-77	16	1	3	1	5	D1	21.9	96																			96	65
8-03-77	16	1	2	3	5	D1	21.9																				0	0
8-03-77	16	1	9	3	5	D1	21.9	62						31													93	187
8-08-77	17	1	3	2	5	N1	21.6	39																			39	0
8-08-77	17	1	3	1	5	N1	21.8	48																			48	0
8-08-77	17	1	2	3	5	N1	21.6	44																			44	0
8-08-77	17	1	9	3	5	N1	21.7																				0	0
8-08-77	17	1	3	2	5	N2	21.8	118																			118	0
8-08-77	17	1	3	1	5	N2	21.8	102																			102	0
8-08-77	17	1	2	3	5	N2	21.7	274																			274	0

Appendix 3. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	D1	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
8-08-77	17	1	9	3	5	N2	21.8	57																			57	0
8-09-77	17	1	3	2	5	D1	21.8	44																			44	0
8-09-77	17	1	3	1	5	D1	21.8																				0	0
8-09-77	17	1	2	3	5	D1	21.7																				0	0
8-09-77	17	1	9	3	5	D1	21.8	59																			59	0
8-09-77	17	1	3	2	5	D2	21.8																				0	0
8-09-77	17	1	3	1	5	D2	21.8																				0	0
8-09-77	17	1	2	3	5	D2	21.8																				0	0
8-09-77	17	1	9	3	5	D2	21.8																				0	0
8-16-77	18	1	3	2	5	D2	21.0	52						13													65	0
8-16-77	18	1	3	1	5	D2	21.0	52																			52	0
8-16-77	18	1	2	3	5	D2	21.0	17																			17	0
8-16-77	18	1	9	3	5	D2	21.0																				0	0
8-16-77	18	1	3	2	5	N1	21.2	32																			32	0
8-16-77	18	1	3	1	5	N1	21.2																				0	0
8-16-77	18	1	2	3	5	N1	21.2																				0	0
8-16-77	18	1	9	3	5	N1	21.0	160																			160	0
8-17-77	18	1	3	2	5	N2	18.6	60																			60	0
8-17-77	18	1	3	1	5	N2	18.6																				0	0
8-17-77	18	1	2	3	5	N2	18.6	44																			44	0
8-17-77	18	1	9	3	5	N2	18.6	133																			133	0
8-17-77	18	1	3	2	5	D1	18.2																				0	0
8-17-77	18	1	3	1	5	D1	18.2																				0	0
8-17-77	18	1	2	3	5	D1	18.2	91																			91	0
8-17-77	18	1	9	3	5	D1	18.2																				0	0
8-22-77	19	1	3	2	5	N1	21.0					42															42	0
8-22-77	19	1	3	1	5	N1	21.0	178																			178	0
8-22-77	19	1	2	3	5	N1	21.0	106																			106	0
8-22-77	19	1	9	3	5	N1	21.0	96																			96	0
8-23-77	19	1	3	2	5	N2	20.9	32																			32	0
8-23-77	19	1	3	1	5	N2	20.9	32																			32	0
8-23-77	19	1	2	3	5	N2	20.9	88																			88	0
8-23-77	19	1	9	3	5	N2	20.9	76																			76	0
8-23-77	19	1	3	2	5	D1	21.0	38																			38	0
8-23-77	19	1	3	1	5	D1	21.0	38																			38	0
8-23-77	19	1	2	3	5	D1	21.0																				0	0
8-23-77	19	1	9	3	5	D1	21.0	22																			22	0
8-23-77	19	1	3	2	5	D2	21.3	24																			24	0
8-23-77	19	1	3	1	5	D2	21.3	13																			13	0
8-23-77	19	1	2	3	5	D2	21.3																				0	0
8-23-77	19	1	9	3	5	D2	21.3	28																			28	0
8-31-77	20	1	3	2	5	D2	21.4																				0	0
8-31-77	20	1	3	1	5	D2	21.4																				0	0
8-31-77	20	1	2	3	5	D2	21.4																				0	0
8-31-77	20	1	9	3	5	D2	21.4																				0	0

Appendix 3. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	D1	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
8-31-77	20	1	3	2	5	N1	21.6																				0	0
8-31-77	20	1	3	1	5	N1	21.6	72																			72	0
8-31-77	20	1	2	3	5	N1	21.6	47																			47	0
8-31-77	20	1	9	3	5	N1	21.6																				0	0
8-31-77	20	1	3	2	5	N2	22.0	52																			52	0
8-31-77	20	1	3	1	5	N2	22.0																				0	0
8-31-77	20	1	2	3	5	N2	22.0																				0	0
8-31-77	20	1	9	3	5	N2	22.0																				0	0
9-01-77	20	1	3	2	5	D1	22.1																				0	0
9-01-77	20	1	3	1	5	D1	22.1																				0	0
9-01-77	20	1	2	3	5	D1	22.1																				0	0
9-01-77	20	1	9	3	5	D1	22.1																				0	0
9-12-77	21	1	3	2	5	N1	18.8																				0	0
9-12-77	21	1	3	1	5	N1	18.8																				0	0
9-12-77	21	1	2	3	5	N1	18.8																				0	0
9-12-77	21	1	9	3	5	N1	18.8																				0	0
9-12-77	21	1	3	2	5	N2	18.6																				0	0
9-12-77	21	1	3	1	5	N2	18.6																				0	0
9-12-77	21	1	2	3	5	N2	18.6					16															16	0
9-12-77	21	1	9	3	5	N2	18.6	17																			17	0
9-13-77	21	1	3	2	5	D1	18.6																				0	0
9-13-77	21	1	3	1	5	D1	18.7																				0	0
9-13-77	21	1	2	3	5	D1	18.6																				0	0
9-13-77	21	1	9	3	5	D1	18.6																				0	0
9-13-77	21	1	3	2	5	D2	18.6																				0	0
9-13-77	21	1	3	1	5	D2	18.7																				0	0
9-13-77	21	1	2	3	5	D2	18.6																				0	0
9-13-77	21	1	9	3	5	D2	18.6																				0	0
9-27-77	22	1	3	2	5	D2	18.6	28																			28	0
9-27-77	22	1	3	1	5	D2	18.6																				0	0
9-27-77	22	1	2	3	5	D2	18.6																				0	0
9-27-77	22	1	9	3	5	D2	18.6																				0	0
9-27-77	22	1	3	2	5	N1	18.2	33																			33	0
9-27-77	22	1	3	1	5	N1	18.2																				0	0
9-27-77	22	1	2	3	5	N1	18.2																				0	0
9-27-77	22	1	9	3	5	N1	18.2																				0	0
9-28-77	22	1	3	2	5	N2	17.8																				0	0
9-28-77	22	1	3	1	5	N2	17.8	25																			25	0
9-28-77	22	1	2	3	5	N2	17.8																				0	0
9-28-77	22	1	9	3	5	N2	17.8																				0	0
9-28-77	22	1	3	2	5	D1	17.8																				0	0
9-28-77	22	1	3	1	5	D1	17.8																				0	0
9-28-77	22	1	2	3	5	D1	17.8																				0	0
9-28-77	22	1	9	3	5	D1	17.8																				0	0
10-06-77	23	1	3	2	5	D2	14.6																				0	0

Appendix 3. Continued.

Date	Mpd	Ser	Grt	N/S	Dpt	Dl	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
	Sample parameters							Species/groups																				
10-06-77	23	1	3	1	5	D2	14.6																				0	0
10-06-77	23	1	2	3	5	D2	14.6																				0	0
10-06-77	23	1	9	3	5	D2	14.6																				0	0
10-06-77	23	1	3	2	5	N1	14.8																				0	0
10-06-77	23	1	3	1	5	N1	14.8																				0	0
10-06-77	23	1	2	3	5	N1	14.8																				0	0
10-06-77	23	1	9	3	5	N1	14.8																				0	0
10-06-77	23	1	3	2	5	N2	14.6																				0	0
10-06-77	23	1	3	1	5	N2	14.6																				0	0
10-06-77	23	1	2	3	5	N2	14.6																				0	0
10-06-77	23	1	9	3	5	N2	14.6																				0	0
10-07-77	23	1	3	2	5	D1	14.4																				0	0
10-07-77	23	1	3	1	5	D1	14.4																				0	0
10-07-77	23	1	2	3	5	D1	14.4																				0	0
10-07-77	23	1	9	3	5	D1	14.4																				0	0
10-10-77	24	1	3	2	5	N1	13.8																				0	0
10-10-77	24	1	3	1	5	N1	13.6																				0	0
10-10-77	24	1	2	3	5	N1	13.8																				0	0
10-10-77	24	1	9	3	5	N1	13.8																				0	0
10-10-77	24	1	3	2	5	N2	13.8																				0	0
10-10-77	24	1	3	1	5	N2	13.6																				0	0
10-10-77	24	1	2	3	5	N2	13.8																				0	0
10-10-77	24	1	9	3	5	N2	13.8																				0	0
10-11-77	24	1	3	2	5	D1	13.8																				0	0
10-11-77	24	1	3	1	5	D1	13.5																				0	0
10-11-77	24	1	2	3	5	D1	13.7																				0	0
10-11-77	24	1	9	3	5	D1	13.7																				0	0
10-11-77	24	1	3	2	5	D2	17.3																				0	0
10-11-77	24	1	3	1	5	D2	16.1																				0	0
10-11-77	24	1	2	3	5	D2	16.2																				0	0
10-11-77	24	3	9	3	5	D2	15.6																				0	0
11-07-77	25	1	3	2	5	N1	11.0																				0	0
11-07-77	25	1	3	1	5	N1	11.0																				0	0
11-07-77	25	1	2	3	5	N1	11.0																				0	0
11-07-77	25	1	9	3	5	N1	11.0																				0	0
11-08-77	25	1	3	2	5	N2	11.0																				0	0
11-08-77	25	1	3	1	5	N2	11.0																				0	0
11-08-77	25	1	2	3	5	N2	11.0																				0	0
11-08-77	25	1	9	3	5	N2	11.0																				0	0
11-08-77	25	1	3	2	5	D1	11.0																				0	0
11-08-77	25	1	3	1	5	D1	11.4																				0	0
11-08-77	25	1	2	3	5	D1	11.0																				0	0
11-08-77	25	1	9	3	5	D1	11.1																				0	0
11-08-77	25	1	3	2	5	D2	11.2																				0	0
11-08-77	25	1	3	1	5	D2	11.4																				0	0
11-08-77	25	1	2	3	5	D2	11.0																				0	0

Appendix 3. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	Dl	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
11-08-77	25	1	9	3	5	D2	11.2																				0	0
12-05-77	26	1	3	2	5	N1	5.0																				0	0
12-05-77	26	1	3	1	5	N1	5.0																				0	0
12-05-77	26	3	2	3	5	N1	5.0																				0	0
12-05-77	26	1	9	3	5	N1	5.0																				0	0
12-05-77	26	1	3	2	5	D2	6.2																				0	0
12-05-77	26	1	3	1	5	D2	6.2																				0	0
12-05-77	26	1	2	3	5	D2	6.2																				0	0
12-05-77	26	1	9	3	5	D2	6.2																				0	0
12-06-77	26	1	3	2	5	N2	3.6																				0	0
12-06-77	26	1	3	1	5	N2	3.6																				0	0
12-06-77	26	1	2	3	5	N2	3.6																				0	0
12-06-77	26	1	9	3	5	N2	3.6																				0	0
12-06-77	26	1	3	2	5	D1	2.8																				0	0
12-06-77	26	1	3	1	5	D1	2.8																				0	0
12-06-77	26	1	2	3	5	D1	2.8																				0	0
12-06-77	26	1	9	3	5	D1	2.8																				0	0
12-13-77	27	1	3	2	5	N2	0.3																				0	0
12-13-77	27	3	3	1	5	N2	1.1																				0	0
12-13-77	27	3	2	3	5	N2	1.4																				0	0
12-13-77	27	1	9	3	5	N2	1.3																				0	0
12-13-77	27	1	3	2	5	D1	2.4																				0	0
12-13-77	27	1	3	1	5	D1	3.5																				0	0
12-13-77	27	1	2	3	5	D1	3.8																				0	0
12-13-77	27	1	9	3	5	D1	3.2																				0	0
12-13-77	27	1	3	2	5	D2	1.7																				0	0
12-13-77	27	1	3	1	5	D2	1.1																				0	0
12-13-77	27	3	2	3	5	D2	4.0																				0	0
12-13-77	27	1	9	3	5	D2	2.3																				0	0
12-13-77	27	3	3	2	5	N1	1.4																				0	0
12-13-77	27	1	3	1	5	N1	1.6																				0	0
12-13-77	27	1	2	3	5	N1	1.8																				0	0
12-13-77	27	1	2	3	5	N1	2.4																				0	0

Appendix 4. Densities (no./1,000 m³) for fish eggs and larvae entrained at the D. C. Cook Plant, southeastern Lake Michigan, 1978. Sample parameter codes are: Mpd (month period): consecutive number of the sample period during the annual sample program. Ser (series): (1) standard series, (2) supplemental sample, (3) problems-sample not used in calculations. Grt (grate): location of forebay grate, see Fig. 3 for reference. N/S (north/south): further designation of sampling location at each grate, (1) north, (2) south, (3) no designation, see Fig. 3 for reference. Dpt (depth): depth (m) of sampling in the forebay. Dl (diel): (N1) midnight to dawn, (D1) dawn to noon, (D2) noon to dusk, (N2) dusk to midnight, (LD and LN) long day or long night, samples extending beyond normal diel schedule, (OD and ON) other day or other night, sampling was performed at irregular intervals. Temp: temperature (C) of intake water when the sample was collected. Refer to Table 1 for species designation. Blank entries indicate zero densities.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	Dl	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
1-10-78	1	1	3	2	5	N1	6.3																				0	0
1-10-78	1	1	3	1	5	N1	6.6																				0	0
1-10-78	1	1	2	3	5	N1	6.0																				0	0
1-10-78	1	1	9	3	5	N1	6.3																				0	0
1-11-78	1	1	3	1	5	N2	6.3																				0	16065
1-11-78	1	1	2	3	5	N2	6.0																				0	0
1-11-78	1	1	9	3	5	N2	6.2																				0	0
1-10-78	1	1	3	2	5	D1	2.8																				0	0
1-10-78	1	1	3	1	5	D1	3.5																				0	0
1-10-78	1	1	2	3	5	D1	3.0																				0	0
1-10-78	1	1	9	3	5	D1	3.1																				0	0
1-10-78	1	1	3	1	5	D2	2.8																				0	0
1-10-78	1	1	2	3	5	D2	2.8																				0	0
1-10-78	1	1	9	3	5	D2	2.8																				0	0
1-24-78	2	1	3	2	5	N1	1.0																				0	0
1-24-78	2	1	3	1	5	N1	1.0																				0	0
1-24-78	2	1	9	3	5	N1	1.0																				0	0
1-24-78	2	1	3	2	5	N2	0.6																				0	0
1-24-78	2	1	3	1	5	N2	0.6																				0	0
1-24-78	2	1	9	3	5	N2	0.6																				0	8
1-25-78	2	1	3	2	5	D1	1.0																				0	27
1-25-78	2	1	3	1	5	D1	1.0																				0	27
1-25-78	2	1	9	3	5	D1	1.0																				0	57
1-25-78	2	1	3	2	5	D2	1.4																				0	20
1-25-78	2	1	3	1	5	D2	1.4																				0	37
1-25-78	2	1	2	3	5	D2	1.4																				0	0
1-25-78	2	1	9	3	5	D2	1.4																				0	42
2-06-78	3	1	3	2	5	N1	0.3																				0	0
2-06-78	3	1	3	1	5	N1	0.6																				0	0
2-06-78	3	1	2	3	5	N1	0.7																				0	0
2-06-78	3	1	9	3	5	N1	0.5																				0	13
2-06-78	3	1	3	2	5	N2	0.1																				0	0
2-06-78	3	1	3	1	5	N2	0.4																				0	0
2-06-78	3	1	2	3	5	N2	0.6																				0	0
2-07-78	3	1	9	3	5	N2	0.4																				0	0
2-07-78	3	1	3	2	5	D1	0.2																				0	0

Appendix 4. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	D1	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
2-07-78	3	1	3	1	5	D1	0.8																				0	0
2-07-78	3	1	2	3	5	D1	0.6																				0	0
2-07-78	3	1	9	3	5	D1	0.5																				0	0
2-07-78	3	1	3	2	5	D2	0.2																				0	0
2-07-78	3	1	3	1	5	D2	0.8																				0	0
2-07-78	3	1	9	3	5	D2	0.6																				0	0
2-23-78	4	1	3	2	5	D2	0.0																				0	0
2-23-78	4	1	3	1	5	D2	0.0																				0	0
2-23-78	4	1	2	3	5	D2	0.0																				0	0
2-23-78	4	1	9	3	5	D2	0.0																				0	0
2-23-78	4	1	3	2	5	N1	0.0																				0	0
2-23-78	4	1	3	1	5	N1	0.0																				0	0
2-23-78	4	1	2	3	5	N1	0.0																				0	0
2-23-78	4	1	9	3	5	N1	0.0																				0	0
2-24-78	4	1	3	2	5	N2	0.0																				0	0
2-24-78	4	1	3	1	5	N2	0.0																				0	0
2-24-78	4	1	2	3	5	N2	0.0																				0	0
2-24-78	4	1	9	3	5	N2	0.0																				0	0
2-24-78	4	1	3	2	5	D1	0.0																				0	0
2-24-78	4	1	3	1	5	D1	0.0																				0	0
2-24-78	4	1	2	3	5	D1	0.0																				0	0
2-24-78	4	1	9	3	5	D1	0.0																				0	0
3-06-78	5	1	3	2	5	N1	0.9																				0	0
3-06-78	5	1	3	1	5	N1	1.0																				0	0
3-06-78	5	1	2	3	5	N1	1.0																				0	0
3-06-78	5	1	9	3	5	N1	1.0																				0	0
3-06-78	5	1	3	2	5	N2	0.6																				0	0
3-07-78	5	1	3	1	5	N2	0.8																				0	0
3-06-78	5	1	2	3	5	N2	0.7																				0	0
3-07-78	5	1	9	3	5	N2	0.7																				0	0
3-07-78	5	1	3	2	5	D1	0.7																				0	0
3-07-78	5	1	3	1	5	D1	0.6																				0	0
3-07-78	5	1	2	3	5	D1	0.8																				0	0
3-07-78	5	1	9	3	5	D1	0.7																				0	0
3-07-78	5	1	3	2	5	D2	0.6																				0	0
3-07-78	5	1	3	1	5	D2	0.6																				0	0
3-07-78	5	1	2	3	5	D2	0.6																				0	0
3-07-78	5	3	9	3	5	D2	0.6																				0	0
3-29-78	6	1	3	2	5	D2	0.0																				0	0
3-29-78	6	1	3	1	5	D2	0.0																				0	0
3-29-78	6	1	2	3	5	D2	0.0																				0	0
3-29-78	6	1	9	3	5	D2	0.0														12						12	0
3-29-78	6	1	3	2	5	N1	0.0																				0	0
3-29-78	6	1	3	1	5	N1	0.0																				0	0
3-29-78	6	1	2	3	5	N1	0.0																				0	0

Appendix 4. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	Dl	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
3-29-78	6	1	9	3	5	N1	0.0																				0	0
3-30-78	6	1	3	2	5	N2	0.0																				0	0
3-30-78	6	1	3	1	5	N2	0.0																				0	0
3-30-78	6	1	2	3	5	N2	0.0																				0	0
3-30-78	6	1	9	3	5	N2	0.0																				0	0
3-30-78	6	1	3	2	5	D1	0.0																				0	0
3-30-78	6	1	3	1	5	D1	0.0																				0	0
3-30-78	6	1	2	3	5	D1	0.0												20								20	0
3-30-78	6	1	9	3	5	D1	0.0																				0	0
4-10-78	7	3	3	2	5	D2	4.8																				0	0
4-10-78	7	1	3	1	5	D2	5.0																				0	0
4-10-78	7	1	2	3	5	D2	4.6																				0	0
4-10-78	7	1	9	3	5	D2	4.8																				0	0
4-10-78	7	3	3	2	5	N1	4.2																				0	0
4-10-78	7	1	3	1	5	N1	4.2																				0	0
4-10-78	7	1	2	3	5	N1	4.2																				0	0
4-10-78	7	1	9	3	5	N1	4.2																				0	0
4-10-78	7	3	3	2	5	N2	3.2																				0	0
4-11-78	7	1	3	1	5	N2	3.3																				0	0
4-11-78	7	1	2	3	5	N2	3.0																				0	0
4-11-78	7	1	9	3	5	N2	3.2																				0	0
4-11-78	7	3	3	2	5	D1	3.7																				0	0
4-11-78	7	1	3	1	5	D1	3.7																				0	0
4-11-78	7	1	2	3	5	D1	3.7																				0	0
4-11-78	7	1	9	3	5	D1	3.7																				0	0
4-26-78	8	1	3	2	5	N2	6.3																				0	0
4-26-78	8	1	3	1	5	N2	6.3																				0	0
4-26-78	8	1	2	3	5	N2	6.3																				0	0
4-26-78	8	1	3	2	5	D1	5.0																				0	0
4-26-78	8	1	3	1	5	D1	5.5																				0	0
4-26-78	8	1	2	3	5	D1	5.5																				0	0
4-26-78	8	1	3	2	5	N1	5.8																				0	0
4-26-78	8	1	3	1	5	N1	5.8																				0	0
4-26-78	8	1	2	3	5	N1	5.8																				0	0
4-27-78	8	1	3	2	5	D2	5.5																				0	0
4-27-78	8	1	3	1	5	D2	5.5																				0	0
4-27-78	8	1	2	3	5	D2	5.5																				0	0
5-09-78	9	1	3	2	5	N1	8.7																				0	0
5-09-78	9	1	2	3	5	N1	9.2																				0	0
5-09-78	9	1	3	1	5	N1	9.0																				0	0
5-09-78	9	2	8	3	5	N1	9.0																				0	0
5-09-78	9	1	3	2	5	N2	8.8				15																15	0
5-09-78	9	1	2	3	5	N2	9.1																				0	0
5-09-78	9	1	3	1	5	N2	9.1																				0	0
5-09-78	9	2	8	3	5	N2	9.2																				0	0

Appendix 4. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	D1	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
5-10-78	9	1	3	1	5	D1	9.3																				0	0
5-10-78	9	1	2	3	5	D1	8.8																				0	0
5-10-78	9	1	3	2	5	D1	8.8																				0	0
5-10-78	9	2	8	3	5	D1	8.9				28																28	0
5-10-78	9	1	3	2	5	D2	8.7																				0	0
5-10-78	9	1	2	3	5	D2	8.6																				0	0
5-10-78	9	1	3	1	5	D2	8.9																				0	0
5-10-78	9	2	8	3	5	D2	8.9			11																	11	0
5-21-78	10	1	3	2	5	N2	7.0																				0	124
5-21-78	10	1	3	1	5	N2	7.0																				0	0
5-21-78	10	1	2	3	5	N2	7.0																				0	0
5-22-78	10	2	8	3	5	N2	7.0																				0	0
5-22-78	10	1	3	2	5	D1	7.0																				0	0
5-22-78	10	1	3	1	5	D1	7.0																				0	0
5-22-78	10	1	2	3	5	D1	7.0																				0	0
5-22-78	10	2	8	3	5	D1	7.0																				0	0
5-22-78	10	1	3	2	5	D2	7.0																				0	0
5-22-78	10	1	3	1	5	D2	7.0																				0	0
5-22-78	10	1	2	3	5	D2	7.0																				0	0
5-22-78	10	2	8	3	5	D2	7.0																				0	0
5-22-78	10	1	3	2	5	N1	10.0	231																			231	0
5-22-78	10	1	3	1	5	N1	10.0																				0	0
5-22-78	10	1	2	3	5	N1	10.0	138			34																172	0
5-22-78	10	2	8	3	5	N1	10.0	114																			114	0
6-05-78	11	1	3	2	5	D2	8.0																				0	50
6-05-78	11	1	3	1	5	D2	8.0																				0	298
6-05-78	11	1	2	3	5	D2	8.0																				0	84
6-05-78	11	2	8	3	5	D2	8.0																				0	613
6-05-78	11	1	3	2	5	N1	8.0																				0	97
6-05-78	11	1	3	1	5	N1	8.0																				0	110
6-05-78	11	1	2	3	5	N1	8.0																				0	72
6-05-78	11	2	8	3	5	N1	8.0															32					32	131
6-05-78	11	1	3	2	5	N2	8.5																				0	0
6-05-78	11	1	3	1	5	N2	8.5																				0	526
6-05-78	11	1	2	3	5	N2	8.5																				0	220
6-05-78	11	2	8	3	5	N2	8.0																				0	358
6-06-78	11	1	3	2	5	D1	9.5							22													22	7190
6-06-78	11	1	3	1	5	D1	9.5																				0	2706
6-06-78	11	3	2	3	5	D1	9.5																				0	2629
6-06-78	11	2	8	3	5	D1	9.0																				0	7626
6-12-78	12	1	3	1	5	N1	17.8															49					49	49744
6-12-78	12	1	3	2	5	N1	18.4																				0	21770
6-12-78	12	1	2	3	5	N1	18.2	45			225																270	81344
6-12-78	12	2	8	3	5	N1	18.1			60	60				60												180	45572
6-12-78	12	1	3	2	5	N2	18.1															14					14	68683

Appendix 4. Continued.

	Sample parameters							Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	Dl	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
6-12-78	12	1	3	1	5	N2	17.6																				0	51039
6-12-78	12	1	2	3	5	N2	18.0				19																19	83075
6-12-78	12	2	8	3	5	N2	17.8																				0	57017
6-13-78	12	1	3	2	5	D1	14.2																				0	12720
6-13-78	12	1	3	1	5	D1	13.6																				0	13684
6-13-78	12	1	2	3	5	D1	18.0	30	30																		60	44145
6-13-78	12	2	8	3	5	D1	15.2																			52	52	11294
6-13-78	12	1	3	2	5	D2	14.2																				0	9631
6-13-78	12	1	3	1	5	D2	9.5															12					12	9474
6-13-78	12	1	2	3	5	D2	12.8				14																14	17774
6-13-78	12	2	8	3	5	D2	12.3																				0	3907
6-18-78	13	1	3	2	5	D2	14.0																				0	992
6-18-78	13	1	3	1	5	D2	14.0		13		93																106	1984
6-18-78	13	1	2	3	5	D2	14.0			16	49																65	1670
6-18-78	13	2	8	3	5	D2	14.0	13			13			26													52	1516
6-18-78	13	1	3	2	5	N1	14.5				169																169	213
6-18-78	13	1	3	1	5	N1	14.5				94																94	380
6-18-78	13	1	2	3	5	N1	14.5																				0	243
6-18-78	13	2	8	3	5	N1	15.0																				0	757
6-18-78	13	1	3	2	5	N2	13.5				54																54	417
6-18-78	13	1	3	1	5	N2	13.5				24																24	554
6-18-78	13	1	2	3	5	N2	13.5				54																54	270
6-18-78	13	2	8	3	5	N2	13.5	21																			21	893
6-19-78	13	1	3	2	5	D1	14.0				40				13												53	726
6-19-78	13	1	3	1	5	D1	14.0							15													15	927
6-19-78	13	1	2	3	5	D1	14.0							38													38	1335
6-19-78	13	2	8	3	5	D1	14.0																				0	646
6-30-78	14	1	3	2	5	N1	18.0	162																			162	13537
6-30-78	14	1	3	1	5	N1	18.0	299																			299	14796
6-30-78	14	1	2	3	5	N1	18.0	140						140													280	20085
6-30-78	14	2	8	3	5	N1	18.0	878			38																916	13575
7-01-78	14	1	3	2	5	N2	15.0																				0	38066
7-01-78	14	1	3	1	5	N2	15.0	79					26														105	53159
7-01-78	14	1	2	3	5	N2	15.0	124					31														155	45842
7-01-78	14	2	8	3	5	N2	15.0	122					73														195	44184
7-01-78	14	1	3	2	5	D1	15.0																				0	5022
7-01-78	14	1	3	1	5	D1	15.0																				0	6296
7-01-78	14	1	2	3	5	D1	15.0																				0	9259
7-01-78	14	2	8	3	5	D1	15.0																				0	10723
7-01-78	14	1	3	2	5	D2	11.0																				0	1506
7-01-78	14	1	3	1	5	D2	11.0																				0	1450
7-01-78	14	1	2	3	5	D2	11.0	60																			60	2556
7-01-78	14	2	8	3	5	D2	11.0																				0	2681
7-05-78	15	1	3	2	5	N1	14.5	52																			52	1161
7-05-78	15	1	3	1	5	N1	14.5	211	42																		253	1950

Appendix 4. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	Dl	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
7-05-78	15	1	2	3	5	N1	14.5	86																			86	2935
7-05-78	15	2	8	3	5	N1	14.5	402	40																		442	1815
7-06-78	15	1	3	2	5	N2	14.5	28	56																		84	1691
7-06-78	15	1	3	1	5	N2	14.5																				0	3625
7-06-78	15	1	2	3	5	N2	14.5	26																			26	7604
7-06-78	15	2	8	3	5	N2	14.5	117																			117	2360
7-06-78	15	1	3	2	5	D1	14.0																				0	524
7-06-78	15	1	3	1	5	D1	14.0	234																			234	1821
7-06-78	15	1	2	3	5	D1	14.0	41	20																		61	2361
7-06-78	15	2	8	3	5	D1	14.0	37																			37	754
7-06-78	15	1	3	2	5	D2	17.0	57						14													71	189
7-06-78	15	1	3	1	5	D2	17.0	67																			67	441
7-06-78	15	1	2	3	5	D2	17.0																				0	260
7-06-78	15	2	8	3	5	D2	17.0	12																			12	256
7-10-78	16	1	3	1	5	N1	9.4				36																36	18477
7-10-78	16	1	3	2	5	N1	9.3																				0	16524
7-10-78	16	1	2	3	5	N1	9.1																				0	26171
7-11-78	16	1	3	1	5	N2	9.2							17													17	8982
7-11-78	16	1	3	2	5	N2	9.1						32	48													80	5749
7-11-78	16	1	2	3	5	N2	9.2							18													18	5275
7-11-78	16	2	8	3	5	N2	9.2							19													19	8615
7-11-78	16	1	3	1	5	D1	10.0																				0	3379
7-11-78	16	1	3	2	5	D1	10.0																				0	2945
7-11-78	16	1	2	3	5	D1	10.5																				0	4284
7-11-78	16	2	8	3	5	D1	10.0																				0	6087
7-11-78	16	1	3	1	5	D2	11.3																				0	4857
7-11-78	16	1	3	2	5	D2	11.3																				0	2041
7-11-78	16	1	2	3	5	D2	11.2																				0	4697
7-11-78	16	2	8	3	5	D2	11.3																				0	5113
7-19-78	17	1	3	2	5	D2	20.0																				0	2476
7-19-78	17	1	3	1	5	D2	20.0																				0	2488
7-19-78	17	1	2	3	5	D2	20.5																				0	2181
7-19-78	17	2	8	3	5	D2	20.0	13																			13	2975
7-19-78	17	1	3	2	5	N1	20.0	36						36													72	105774
7-19-78	17	1	3	1	5	N1	20.0	117			39																156	58842
7-19-78	17	1	2	3	5	N1	20.2	802	126																		928	199883
7-19-78	17	2	8	3	5	N1	20.0	452																			452	43860
7-20-78	17	1	3	2	5	N2	20.2	20																			20	92186
7-20-78	17	1	3	1	5	N2	20.0																				0	97521
7-20-78	17	1	2	3	5	N2	20.0		23																		23	118193
7-20-78	17	2	8	3	5	N2	20.0	38																			38	61580
7-20-78	17	1	3	2	5	D1	21.5																				0	6105
7-20-78	17	1	3	1	5	D1	21.5	30						15													45	11924
7-20-78	17	1	2	3	5	D1	21.5							18													18	11305
7-20-78	17	2	8	3	5	D1	21.2	45																			45	19290

Appendix 4. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	Dl	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
7-25-78	18	1	3	2	5	N1	20.0	70	35					35													140	1691
7-25-78	18	1	3	1	5	N1	20.0	78					39	39													156	5589
7-25-78	18	1	2	3	5	N1	20.0	231																			231	4878
7-25-78	18	1	9	3	5	N1	20.0	645			142																787	12198
7-25-78	18	1	3	2	5	N2	20.0	111																			111	22577
7-25-78	18	1	3	1	5	N2	20.0	165																			165	20138
7-25-78	18	1	2	3	5	N2	20.0	44	22																		66	36374
7-25-78	18	1	9	3	5	N2	20.0																				0	22896
7-26-78	18	1	3	2	5	D1	20.0	87																			87	1526
7-26-78	18	1	3	1	5	D1	20.0	49																			49	1998
7-26-78	18	1	2	3	5	D1	20.0	123																			123	7380
7-26-78	18	1	9	3	5	D1	20.0	80																			80	6401
7-26-78	18	1	3	2	5	D2	20.5	82																			82	1066
7-26-78	18	1	3	1	5	D2	20.5	235																			235	1410
7-26-78	18	1	2	3	5	D2	20.5	85																			85	1720
7-26-78	18	1	9	3	5	D2	20.5	148																			148	2565
8-01-78	19	1	3	2	5	N1	8.0																				0	33
8-01-78	19	1	3	1	5	N1	8.0	40																			40	161
8-01-78	19	1	2	3	5	N1	8.0					35															35	142
8-01-78	19	1	9	3	5	N1	8.0																				0	174
8-01-78	19	1	3	2	5	N2	11.0	19																			19	39
8-01-78	19	1	3	1	5	N2	11.0																				0	113
8-01-78	19	1	2	3	5	N2	11.0																				0	150
8-01-78	19	1	9	3	5	N2	11.0																				0	117
8-02-78	19	1	3	2	5	D1	15.0																				0	77
8-02-78	19	1	3	1	5	D1	15.0																				0	36
8-02-78	19	1	2	3	5	D1	15.0																				0	65
8-02-78	19	1	9	3	5	D1	15.0																				0	154
8-02-78	19	1	3	2	5	D2	17.0																				0	104
8-02-78	19	1	3	1	5	D2	17.0	30																			30	75
8-02-78	19	1	2	3	5	D2	17.0	53																			53	277
8-02-78	19	1	9	3	5	D2	17.0	143																			143	156
8-07-78	20	1	3	2	5	N1	20.0																				0	0
8-07-78	20	1	2	3	5	N1	20.6	126																			126	0
8-07-78	20	1	9	3	5	N1	20.2																				0	0
8-08-78	20	1	3	2	5	N2	21.1		31				15	15													61	2435
8-08-78	20	1	2	3	5	N2	20.2	17	102																		119	3507
8-08-78	20	1	3	1	5	N2	20.4	18	18								18										54	5284
8-08-78	20	1	9	3	5	N2	20.4			34	17																51	6595
8-08-78	20	1	3	2	5	D1	20.7	38																			38	1355
8-08-78	20	1	2	3	5	D1	20.5	48																			48	870
8-08-78	20	1	3	1	5	D1	21.1																				0	812
8-08-78	20	1	9	3	5	D1	20.0																				0	4634
8-08-78	20	1	3	2	5	D2	21.5	100																			100	230
8-08-78	20	1	2	3	5	D2	21.5	55																			55	125

Appendix 4. Continued.

Date	Mpd	Ser	Grt	N/S	Dpt	D1	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
Sample parameters								Species/groups																				
8-08-78	20	1	3	3	5	D2	21.5	48																			48	146
8-08-78	20	1	9	3	5	D2	21.5																				0	112
8-14-78	21	1	3	2	5	N1	15.5																				0	0
8-14-78	21	1	3	1	5	N1	15.5																				0	0
8-14-78	21	2	8	3	5	N1	15.5						32														32	0
8-15-78	21	1	3	2	5	N2	16.0	18																			18	0
8-15-78	21	1	3	1	5	N2	16.0																				0	83
8-15-78	21	2	8	3	5	N2	16.0																				0	561
8-15-78	21	1	3	2	5	D1	22.0																				0	0
8-15-78	21	1	3	1	5	D1	22.0																				0	66
8-15-78	21	2	8	3	5	D1	22.0																				0	22
8-15-78	21	1	3	2	5	D2	23.0	26	13																		39	26
8-15-78	21	1	3	1	5	D2	23.0																				0	0
8-15-78	21	2	8	3	5	D2	23.0										13										13	55
8-22-78	22	1	3	2	5	N1	17.0																				0	0
8-22-78	22	1	3	1	5	N1	17.0	54						27													81	0
8-22-78	22	1	2	3	5	N1	17.0	26						52													78	0
8-22-78	22	2	8	3	5	N1	17.0																				0	0
8-22-78	22	1	3	2	5	N2	22.5	34																			34	0
8-22-78	22	1	3	1	5	N2	22.5	85						51													136	51
8-22-78	22	1	2	3	5	N2	22.5	51																			51	17
8-22-78	22	2	8	3	5	N2	22.5	18						36													54	18
8-23-78	22	1	3	2	5	D1	23.5																				0	0
8-23-78	22	3	3	1	5	D1	23.5																				0	0
8-23-78	22	1	2	3	5	D1	23.5																				0	0
8-23-78	22	2	8	3	5	D1	23.5	21																			21	0
8-23-78	22	1	3	2	5	D2	24.5							14													14	14
8-23-78	22	1	3	1	5	D2	24.5	27	13																		40	0
8-23-78	22	1	2	3	5	D2	24.5																				0	0
8-23-78	22	2	8	3	5	D2	24.5																				0	0
8-30-78	23	1	3	2	5	N1	23.0																				0	0
8-30-78	23	1	3	1	5	N1	23.0																				0	0
8-30-78	23	1	2	3	5	N1	23.0																				0	0
8-30-78	23	2	8	3	5	N1	23.0																				0	0
8-31-78	23	1	3	2	5	N2	22.0																				0	0
8-31-78	23	1	3	1	5	N2	22.0																				0	0
8-31-78	23	1	2	3	5	N2	22.0																				0	0
8-31-78	23	2	8	3	5	N2	22.0																				0	0
8-31-78	23	1	3	2	5	D1	22.0																				0	0
8-31-78	23	1	3	1	5	D1	22.0																				0	0
8-31-78	23	1	2	3	5	D1	22.0	19																			19	0
8-31-78	23	2	8	3	5	D1	23.0																				0	0
8-31-78	23	1	3	2	5	D2	24.0																				0	0
8-31-78	23	1	3	1	5	D2	24.0																				0	0
8-31-78	23	1	2	3	5	D2	24.0																				0	0

Appendix 4. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	D1	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
8-31-78	23	2	8	3	5	D2	24.0																				0	0
8-29-78	23	2	3	2	5	LN	23.0																				0	0
8-29-78	23	2	3	1	5	LN	23.0	8																			8	17
8-29-78	23	2	2	3	5	LN	23.0																				0	0
8-29-78	23	2	8	3	5	LN	23.0																				0	0
9-11-78	24	1	3	2	5	N1	27.0																				0	0
9-11-78	24	1	3	1	5	N1	25.0																				0	0
9-11-78	24	1	2	3	5	N1	25.0																				0	0
9-11-78	24	2	8	3	5	N1	25.0	45																			45	0
9-12-78	24	1	3	2	5	N2	25.2																				0	0
9-12-78	24	1	3	1	5	N2	25.0																				0	0
9-12-78	24	1	2	3	5	N2	25.0																				0	0
9-12-78	24	2	8	3	5	N2	25.2																				0	0
9-12-78	24	1	3	2	5	D1	25.0																				0	0
9-12-78	24	1	3	1	5	D1	25.0																				0	0
9-12-78	24	1	2	3	5	D1	25.0																				0	0
9-12-78	24	2	8	3	5	D1	24.9																				0	0
9-12-78	24	1	3	2	5	D2	25.0																				0	0
9-12-78	24	1	3	1	5	D2	24.9																				0	0
9-12-78	24	1	2	3	5	D2	24.7																				0	0
9-12-78	24	2	8	3	5	D2	24.7																				0	0
9-25-78	25	1	3	2	5	D2	18.0	42																			42	0
9-25-78	25	1	3	1	5	D2	17.5	15																			15	0
9-25-78	25	1	2	3	5	D2	17.5																				0	0
9-25-78	25	2	8	3	5	D2	18.0	45																			45	0
9-25-78	25	1	3	2	5	N1	17.0	24																			24	0
9-25-78	25	1	3	1	5	N1	17.0	48																			48	0
9-25-78	25	1	2	3	5	N1	17.0	46																			46	0
9-25-78	25	2	8	3	5	N1	17.0																				0	0
9-26-78	25	1	3	2	5	N2	18.0							16													16	16
9-26-78	25	1	3	1	5	N2	18.0											15									15	0
9-26-78	25	1	2	3	5	N2	18.0	30																			30	0
9-26-78	25	2	8	3	5	N2	18.0																				0	0
9-26-78	25	1	3	2	5	D1	18.0							27													27	0
9-26-78	25	1	3	1	5	D1	18.0																				0	0
9-26-78	25	1	2	3	5	D1	18.0																				0	0
9-26-78	25	2	8	3	5	D1	18.0																				0	0
9-28-78	25	1	3	2	5	N1	17.0																				0	0
9-28-78	25	1	3	1	5	N1	17.0	26																			26	0
9-28-78	25	1	2	3	5	N1	17.0	52																			52	0
9-28-78	25	2	8	3	5	N1	16.0																				0	11
10-09-78	26	3	3	2	5	N1	16.9																				0	0
10-09-78	26	1	2	3	5	N1	16.9																				0	0
10-09-78	26	1	3	1	5	N1	16.9	253																			253	0
10-09-78	26	1	9	3	5	N1	16.9	24																			24	0

Appendix 4. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	D1	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
10-10-78	26	1	2	3	5	N2	15.8	22																			22	0
10-10-78	26	1	3	1	5	N2	15.8	125						25													150	0
10-10-78	26	1	3	2	5	N2	15.8	283																			283	0
10-10-78	26	1	9	3	5	N2	15.8	33						11													44	11
10-10-78	26	1	3	2	5	D1	15.8	136																			136	0
10-10-78	26	1	2	3	5	D1	15.8																				0	0
10-10-78	26	1	3	1	5	D1	15.8	102						51													153	0
10-10-78	26	1	9	3	5	D1	15.8	30																			30	0
10-10-78	26	1	3	2	5	D2	16.8																				0	0
10-10-78	26	1	2	3	5	D2	16.8																				0	0
10-10-78	26	1	3	1	5	D2	16.8																				0	0
10-10-78	26	1	9	3	5	D2	16.8																				0	0
10-23-78	27	1	3	2	5	D2	14.0																				0	0
10-23-78	27	3	3	1	5	D2	14.0																				0	0
10-23-78	27	1	2	3	5	D2	14.0																				0	0
10-23-78	27	2	8	3	5	D2	14.0																				0	0
10-23-78	27	1	3	2	5	N1	14.0	42																			42	0
10-23-78	27	1	2	3	5	N1	14.0																				0	0
10-23-78	27	2	8	3	5	N1	14.0	15																			15	0
10-23-78	27	1	3	2	5	N2	15.0																				0	0
10-23-78	27	1	2	3	5	N2	15.0																				0	0
10-23-78	27	2	8	3	5	N2	15.0																				0	0
10-24-78	27	1	3	2	5	D1	14.5																				0	0
10-24-78	27	1	2	3	5	D1	14.5																				0	0
10-24-78	27	2	8	3	5	D1	14.5																				0	0
11-13-78	28	1	3	2	5	N1	11.3																				0	0
11-13-78	28	1	3	1	5	N1	11.2																				0	0
11-13-78	28	1	2	3	5	N1	11.8																				0	0
11-13-78	28	1	9	3	5	N1	11.2																				0	0
11-14-78	28	1	3	2	5	N2	11.5	13																			13	0
11-14-78	28	1	3	1	5	N2	11.1																				0	0
11-14-78	28	1	2	3	5	N2	11.8																				0	0
11-14-78	28	1	9	3	5	N2	11.5																				0	0
11-14-78	28	1	3	2	5	D1	11.0																				0	0
11-14-78	28	1	3	1	5	D1	11.0																				0	0
11-14-78	28	1	2	3	5	D1	11.5																				0	0
11-14-78	28	1	9	3	5	D1	11.0																				0	0
11-14-78	28	1	3	2	5	D2	11.0																				0	0
11-14-78	28	1	3	1	5	D2	11.0																				0	0
11-14-78	28	1	2	3	5	D2	11.5	17																			17	0
11-14-78	28	1	9	3	5	D2	11.3																				0	0
11-29-78	29	1	3	2	5	N1	8.5																				0	0
11-29-78	29	1	3	1	5	N1	8.5																				0	0
11-29-78	29	1	2	3	5	N1	8.5																				0	0
11-29-78	29	1	9	3	5	N1	8.5																				0	0

Appendix 4. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	D1	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
11-30-78	29	1	3	2	5	N2	6.5																				0	0
11-30-78	29	1	3	1	5	N2	6.5																				0	0
11-30-78	29	3	2	3	5	N2	6.5																				0	0
11-30-78	29	1	9	3	5	N2	6.5																				0	0
11-30-78	29	1	3	2	5	D1	6.0																				0	0
11-30-78	29	1	3	1	5	D1	6.0																				0	0
11-30-78	29	1	2	3	5	D1	6.0																				0	0
11-30-78	29	1	9	3	5	D1	6.0																				0	0
11-30-78	29	1	3	2	5	D2	6.0																				0	0
11-30-78	29	1	3	1	5	D2	6.0																				0	0
11-30-78	29	1	2	3	5	D2	6.0																				0	0
11-30-78	29	1	9	3	5	D2	6.0																				0	0
12-04-78	30	1	3	2	5	N1	6.5																				0	0
12-04-78	30	1	3	1	5	N1	5.0																				0	0
12-04-78	30	1	2	3	5	N1	6.3																				0	0
12-04-78	30	2	8	3	5	N1	6.3																				0	0
12-05-78	30	1	3	2	5	N2	5.2																				0	0
12-05-78	30	1	3	1	5	N2	5.0																				0	0
12-05-78	30	3	2	3	5	N2	5.0																				0	0
12-05-78	30	2	8	3	5	N2	5.1																				0	0
12-05-78	30	1	3	2	5	D1	5.0																				0	0
12-05-78	30	1	3	1	5	D1	6.5																				0	0
12-05-78	30	1	2	3	5	D1	6.5																				0	0
12-05-78	30	2	8	3	5	D1	6.0																				0	0
12-05-78	30	1	3	2	5	D2	7.0																				0	0
12-05-78	30	1	3	1	5	D2	5.3																				0	0
12-05-78	30	1	2	3	5	D2	4.2																				0	0
12-05-78	30	2	8	3	5	D2	5.7																				0	0
12-19-78	31	1	3	2	5	N2	2.5																				0	0
12-19-78	31	1	3	1	5	N2	2.5																				0	0
12-19-78	31	1	2	3	5	N2	2.5																				0	0
12-19-78	31	1	9	3	5	N2	2.5																				0	0
12-20-78	31	1	3	2	5	D1	4.0																				0	0
12-20-78	31	1	2	3	5	D1	4.0																				0	0
12-20-78	31	1	9	3	5	D1	4.0																				0	0
12-20-78	31	1	3	2	5	D2	4.0																				0	0
12-20-78	31	1	3	1	5	D2	4.0																				0	0
12-20-78	31	1	2	3	5	D2	4.0																				0	0
12-20-78	31	1	9	3	5	D2	4.0																				0	0
12-20-78	31	1	3	2	5	N1	7.0																				0	0
12-20-78	31	1	3	1	5	N1	7.0																				0	0
12-20-78	31	1	2	3	5	N1	7.0																				0	0
12-20-78	31	1	9	3	5	N1	7.0																				0	0

Appendix 5. Densities (no./1,000 m³) for fish eggs and larvae entrained at the D. C. Cook Plant, southeastern Lake Michigan, 1979. Sample parameter codes are: Mpd (month period): consecutive number of the sample period during the annual sample program. Ser (series): (1) standard series, (2) supplemental sample, (3) problems-sample not used in calculations. Grt (grate): location of forebay grate, see Fig. 3 for reference. N/S (north/south): further designation of sampling location at each grate, (1) north, (2) south, (3) no designation, see Fig. 3 for reference. Dpt (depth): depth (m) of sampling in the forebay. Dl (diel): (N1) midnight to dawn, (D1) dawn to noon, (D2) noon to dusk, (N2) dusk to midnight, (LD and LN) long day or long night, samples extending beyond normal diel schedule, (OD and ON) other day or other night, sampling was performed at irregular intervals. Temp: temperature (C) of intake water when the sample was collected. Refer to Table 1 for species designation. Blank entries indicate zero densities.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	Dl	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
1-08-79	1	1	3	2	5	N1	0.9																				0	0
1-08-79	1	1	3	1	5	N1	1.0																				0	0
1-08-79	1	1	2	3	5	N1	1.0																				0	0
1-08-79	1	1	9	3	5	N1	1.0																				0	0
1-09-79	1	1	3	2	5	N2	0.9																				0	0
1-09-79	1	3	3	1	5	N2	1.0																				0	0
1-09-79	1	1	2	3	5	N2	1.0																				0	0
1-09-79	1	1	9	3	5	N2	1.0																				0	0
1-09-79	1	1	3	2	5	D1	1.4																				0	0
1-09-79	1	1	3	1	5	D1	1.6																				0	0
1-09-79	1	1	2	3	5	D1	1.7																				0	0
1-09-79	1	1	9	3	5	D1	1.6																				0	0
1-09-79	1	1	3	2	5	D2	4.5																				0	0
1-09-79	1	1	3	1	5	D2	1.4																				0	0
1-09-79	1	1	2	3	5	D2	1.7																				0	0
1-09-79	1	1	9	3	5	D2	1.5																				0	0
1-25-79	2	1	3	2	5	D2	5.6																				0	91
1-25-79	2	1	2	3	5	D2	5.6																				0	0
1-25-79	2	1	9	3	5	D2	5.6																				0	202
1-25-79	2	1	3	2	5	N1	7.2																				0	52
1-25-79	2	1	2	3	5	N1	7.2																				0	0
1-25-79	2	1	9	3	5	N1	7.2																				0	111
1-26-79	2	1	3	2	5	N2	5.0																				0	0
1-26-79	2	1	2	3	5	N2	5.0																				0	35
1-26-79	2	1	9	3	5	N2	5.0																				0	172
1-26-79	2	1	3	2	5	D1	5.0																				0	0
1-26-79	2	1	2	3	5	D1	5.0																				0	0
1-26-79	2	1	9	3	5	D1	5.0																				0	409
2-12-79	3	1	3	2	5	N1	3.8																				0	0
2-12-79	3	1	3	1	5	N1	4.8																				0	0
2-12-79	3	1	2	3	5	N1	4.5																				0	0
2-12-79	3	1	9	3	5	N1	4.3																				0	0
2-13-79	3	1	3	2	5	N2	6.7																				0	0
2-13-79	3	1	3	1	5	N2	6.2																				0	0
2-13-79	3	1	2	3	5	N2	6.5																				0	0
2-13-79	3	1	9	3	5	N2	6.5																				0	0

Appendix 5. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	Dl	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
2-13-79	3	1	3	2	5	D1	6.2																				0	0
2-13-79	3	1	3	1	5	D1	7.5																				0	0
2-13-79	3	1	2	3	5	D1	6.8																				0	0
2-13-79	3	1	9	3	5	D1	6.8																				0	0
2-13-79	3	1	3	2	5	D2	6.8																				0	0
2-13-79	3	1	3	1	5	D2	7.1																				0	0
2-13-79	3	1	2	3	5	D2	7.0																				0	0
2-13-79	3	1	9	3	5	D2	6.9																				0	36
2-22-79	4	1	3	2	5	D2	6.7																				0	0
2-22-79	4	1	3	1	5	D2	6.7																				0	0
2-22-79	4	1	2	3	5	D2	6.7																				0	0
2-22-79	4	1	9	3	5	D2	6.7																				0	0
2-22-79	4	1	3	2	5	N1	5.0																				0	0
2-22-79	4	1	3	1	5	N1	5.0																				0	0
2-22-79	4	1	2	3	5	N1	5.0																				0	0
2-22-79	4	1	9	3	5	N1	5.0																				0	0
2-23-79	4	1	3	2	5	N2	3.9																				0	0
2-23-79	4	1	3	1	5	N2	3.9																				0	0
2-23-79	4	1	2	3	5	N2	3.9																				0	0
2-23-79	4	1	9	3	5	N2	3.9																				0	0
2-23-79	4	1	3	2	5	D1	2.8																				0	0
2-23-79	4	1	3	1	5	D1	2.8																				0	0
2-23-79	4	1	2	3	5	D1	2.8																				0	0
2-23-79	4	1	9	3	5	D1	2.8																				0	0
3-05-79	5	1	3	2	5	N1	3.0																				0	0
3-05-79	5	1	3	1	5	N1	0.2																				0	0
3-05-79	5	1	2	3	5	N1	0.3																				0	0
3-05-79	5	1	9	3	5	N1	1.1																				0	0
3-06-79	5	3	3	2	5	N2	2.5																				0	0
3-06-79	5	1	3	1	5	N2	1.1																				0	0
3-06-79	5	1	2	3	5	N2	0.8																				0	0
3-06-79	5	1	9	3	5	N2	1.5																				0	0
3-06-79	5	1	3	1	5	D1	5.9																				0	0
3-06-79	5	1	2	3	5	D1	5.9																				0	0
3-06-79	5	1	9	3	5	D1	5.9																				0	0
3-06-79	5	1	3	1	5	D2	6.5																				0	0
3-06-79	5	1	2	3	5	D2	5.5																				0	0
3-06-79	5	1	9	3	5	D2	6.0																				0	0
3-22-79	6	1	3	1	5	D2	6.7																				0	0
3-22-79	6	1	2	3	5	D2	6.7																				0	0
3-22-79	6	1	9	3	5	D2	6.7																				0	0
3-22-79	6	1	3	2	5	N1	6.7																				0	0
3-22-79	6	1	3	1	5	N1	6.7																				0	21
3-22-79	6	1	2	3	5	N1	6.7																				0	0
3-22-79	6	1	9	3	5	N1	6.7																				0	19

Appendix 5. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	Dl	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
3-23-79	6	1	3	2	5	N2	8.3																				0	24
3-23-79	6	1	3	1	5	N2	8.3																				0	16
3-23-79	6	1	2	3	5	N2	8.3																				0	0
3-23-79	6	1	9	3	5	N2	8.3																				0	0
3-23-79	6	1	3	2	5	D1	7.2																				0	0
3-23-79	6	1	3	1	5	D1	7.2																				0	0
3-23-79	6	1	2	3	5	D1	7.2																				0	0
3-23-79	6	1	9	3	5	D1	7.2																				0	0
4-09-79	7	1	3	2	5	N1	3.7																				0	0
4-09-79	7	1	3	1	5	N1	3.2																				0	0
4-09-79	7	1	2	3	5	N1	4.2																				0	61
4-09-79	7	1	9	3	5	N1	3.7																				0	0
4-10-79	7	1	3	2	5	N2	3.2																				0	0
4-10-79	7	1	3	1	5	N2	3.3																				0	0
4-10-79	7	1	2	3	5	N2	3.4																				0	13
4-10-79	7	1	9	3	5	N2	3.3																				0	0
4-10-79	7	1	3	2	5	D1	2.9																				0	0
4-10-79	7	1	2	3	5	D1	2.9																				0	0
4-10-79	7	1	9	3	5	D1	3.0																				0	0
4-10-79	7	1	3	2	5	D2	3.2																				0	0
4-10-79	7	1	3	1	5	D2	3.4																				0	0
4-10-79	7	1	2	3	5	D2	3.2																				0	0
4-10-79	7	1	9	3	5	D2	3.3																				0	0
4-29-79	8	1	3	2	5	N1	7.0																				0	0
4-29-79	8	1	3	1	5	N1	7.0																				0	0
4-29-79	8	1	2	3	5	N1	7.0																				0	0
4-29-79	8	1	9	3	5	N1	7.0																				0	0
4-30-79	8	1	3	2	5	N2	8.0																				0	19
4-30-79	8	1	3	1	5	N2	8.0																				0	0
4-30-79	8	1	2	3	5	N2	8.0																				0	0
4-30-79	8	1	9	3	5	N2	8.0																				0	0
4-30-79	8	1	3	2	5	D1	8.0			23																	23	0
4-30-79	8	1	3	1	5	D1	8.0																				0	0
4-30-79	8	1	2	3	5	D1	8.0							18													18	0
4-30-79	8	1	9	3	5	D1	8.0																				0	0
4-30-79	8	1	3	1	5	D2	8.0																				0	0
4-30-79	8	1	2	3	5	D2	8.0																				0	0
4-30-79	8	1	9	3	5	D2	8.0																				0	0
5-07-79	9	1	3	2	5	N1	11.2																				0	0
5-07-79	9	1	3	1	5	N1	10.2																				0	0
5-07-79	9	1	2	3	5	N1	10.3																				0	0
5-07-79	9	2	8	3	5	N1	10.5																				0	0
5-08-79	9	1	3	2	5	N2	10.0																				0	0
5-08-79	9	1	3	1	5	N2	10.1																				0	32
5-08-79	9	1	2	3	5	N2	10.2																				0	0

Appendix 5. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	D1	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
5-08-79	9	2	8	3	5	N2	10.1																				0	0
5-08-79	9	1	3	2	5	D1	10.6																				0	25
5-08-79	9	1	3	1	5	D1	11.0																				0	0
5-08-79	9	1	2	3	5	D1	11.3																				0	0
5-08-79	9	2	8	3	5	D1	10.9																				0	0
5-08-79	9	1	3	2	5	D2	10.9																				0	31
5-08-79	9	1	3	1	5	D2	11.1																				0	25
5-08-79	9	1	2	3	5	D2	11.1																				0	10
5-08-79	9	2	8	3	5	D2	11.0																				0	36
5-24-79	10	1	2	3	5	D2	9.0		49																		49	346
5-24-79	10	1	3	1	5	D2	9.0		17	34				17													68	17
5-24-79	10	1	3	2	5	D2	9.0		58	117																	175	58
5-24-79	10	2	8	3	5	D2	9.0																				0	13
5-24-79	10	1	2	3	5	N1	9.0		79	26																	105	80
5-24-79	10	3	3	1	5	N1	9.0		1096	3288																	4384	0
5-24-79	10	1	3	2	5	N1	9.0		47	235			47														329	0
5-24-79	10	2	8	3	5	N1	9.0		58																		58	0
5-25-79	10	1	2	3	5	N2	9.0		15														15				30	299
5-25-79	10	3	3	1	5	N2	9.0			19570																	19570	0
5-25-79	10	1	3	2	5	N2	9.0		27	135				27		27											216	81
5-25-79	10	1	2	3	5	D1	9.0																				0	59
5-25-79	10	3	3	1	5	D1	9.0			5180																	5180	0
5-25-79	10	1	3	2	5	D1	9.0			84																	84	42
6-06-79	11	1	2	3	5	D2	13.0										11										11	0
6-06-79	11	3	3	1	5	D2	13.0																				0	0
6-06-79	11	1	3	2	5	D2	13.0																				0	0
6-06-79	11	1	9	3	5	D2	13.0																				0	0
6-06-79	11	1	2	3	5	N1	13.0				35						35										70	0
6-06-79	11	3	3	1	5	N1	13.0																				0	0
6-06-79	11	1	3	2	5	N1	13.0																				0	0
6-06-79	11	1	9	3	5	N1	13.0															33					33	0
6-07-79	11	1	2	3	5	N2	13.0															22					22	0
6-07-79	11	3	3	1	5	N2	13.0																				0	0
6-07-79	11	1	3	2	5	N2	13.0																				0	0
6-07-79	11	1	9	3	5	N2	13.0																				0	0
6-07-79	11	1	2	3	5	D1	14.0																				0	0
6-07-79	11	3	3	1	5	D1	14.0																				0	0
6-07-79	11	1	3	2	5	D1	14.0			16																	16	0
6-07-79	11	1	9	3	5	D1	14.0												15								15	0
6-20-79	12	1	2	3	5	D2	16.0	27																			27	2167
6-20-79	12	1	3	2	5	D2	16.0	38	19					114													171	849
6-20-79	12	1	2	3	5	N1	16.0	46			23			23													92	3246
6-20-79	12	1	3	1	5	N1	16.0	188			23		92	212		23											538	3573
6-20-79	12	1	3	2	5	N1	16.0	920						87			29										1036	356
6-21-79	12	1	2	3	5	N2	16.0	23																			23	943

Appendix 5. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	Dl	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
6-21-79	12	1	3	1	5	N2	16.0	69								23											92	609
6-21-79	12	1	3	2	5	N2	16.0	265																			265	118
6-21-79	12	1	3	2	5	D1	16.0	121																			121	87
6-21-79	12	1	2	3	5	D2	16.0	13			52			39													104	438
6-21-79	12	1	3	1	5	D2	16.0	136					94			13											243	209
6-21-79	12	1	3	2	5	D2	16.0	99					148	82									49				378	83
6-21-79	12	1	9	3	5	D2	16.0	91	39				39	39								39					247	208
6-21-79	12	1	2	3	5	N1	16.5	123					73	24													220	49
6-21-79	12	1	3	1	5	N1	16.5	125			75					25											225	125
6-21-79	12	1	3	2	5	N1	16.5	122			182																304	122
6-21-79	12	1	9	3	5	N1	16.5	48				72		48								48					216	193
6-22-79	12	1	2	3	5	N2	17.0	46																			46	463
6-22-79	12	1	3	1	5	N2	17.0	24						72													96	293
6-22-79	12	1	3	2	5	N2	17.0	113						56													169	86
6-22-79	12	1	9	3	5	N2	17.0	104														26					130	367
6-22-79	12	1	2	3	5	D1	17.0	26						13													39	122
6-22-79	12	1	3	1	5	D1	17.0	112																			112	127
6-22-79	12	1	3	2	5	D1	17.0							68		17											85	17
6-22-79	12	1	9	3	5	D1	17.0	45						47		30											122	143
6-27-79	13	1	2	3	5	D2	14.0	61						25													86	437
6-27-79	13	1	3	1	5	D2	14.0	66																			66	444
6-27-79	13	1	3	2	5	D2	14.0	49																			49	99
6-27-79	13	1	9	3	5	D2	14.0	28																			28	280
6-27-79	13	1	2	3	5	N1	14.0	118				29					29										176	239
6-27-79	13	1	3	1	5	N1	14.0	30								30											60	122
6-27-79	13	1	3	2	5	N1	14.0	37				75										37					149	75
6-27-79	13	1	9	3	5	N1	14.0	65								32											97	228
6-28-79	13	1	2	3	5	N2	13.0	42																			42	253
6-28-79	13	1	3	1	5	N2	13.0																				0	86
6-28-79	13	1	3	2	5	N2	13.0	52								26											78	211
6-28-79	13	1	9	3	5	N2	13.0							96		24											120	96
6-28-79	13	1	2	3	5	D1	13.0	81																			81	288
6-28-79	13	1	3	1	5	D1	13.0	56																			56	98
6-28-79	13	1	3	2	5	D1	13.0	51								17											68	17
6-28-79	13	1	9	3	5	D1	13.0	120								15											135	165
7-05-79	14	1	2	3	5	D2	15.0	81			13																94	413
7-05-79	14	1	3	1	5	D2	15.0							16													16	384
7-05-79	14	1	3	2	5	D2	15.0	13																			13	245
7-05-79	14	2	8	3	5	D2	15.0	24																			24	727
7-05-79	14	1	2	3	5	N1	15.0	36					108										72				216	1045
7-05-79	14	1	3	1	5	N1	15.0																				0	1644
7-05-79	14	1	3	2	5	N1	15.0					35		35													70	1878
7-05-79	14	2	8	3	5	N1	15.0						130														130	3072
7-06-79	14	1	2	3	5	N2	15.0	72					48										24				144	10691
7-06-79	14	1	3	1	5	N2	15.0	28					28	28													84	15622
7-06-79	14	1	3	2	5	N2	15.0	72	24				24														120	15925

Appendix 5. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	D1	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
7-06-79	14	2	8	3	5	N2	15.0				23			23									23				69	17964
7-06-79	14	1	2	3	5	D1	15.0	49																			49	677
7-06-79	14	1	3	1	5	D1	15.0	96			19																115	829
7-06-79	14	1	3	2	5	D1	15.0	51						17													68	834
7-06-79	14	2	8	3	5	D1	15.0							30													30	1383
7-09-79	15	1	3	2	5	N1	16.7	356			59			59													474	3213
7-09-79	15	1	3	1	5	N1	16.8	957																			957	1627
7-09-79	15	1	2	3	5	N1	16.9	1118																			1118	2555
7-09-79	15	2	8	3	5	N1	16.8	1050		45			136														1231	4065
7-09-79	15	1	3	2	5	N2	16.3	261	37					37													335	17493
7-09-79	15	1	3	1	5	N2	16.7	322	46			23		184													575	19066
7-09-79	15	1	2	3	5	N2	16.7	213	14					57													284	12953
7-09-79	15	2	8	3	5	N2	16.7	320			24			12									12				368	22713
7-10-79	15	1	3	2	5	D1	16.6	128																			128	2323
7-10-79	15	1	3	1	5	D1	16.9	66																			66	1039
7-10-79	15	1	2	3	5	D1	17.1																				0	789
7-10-79	15	2	8	3	5	D1	16.9	178																			178	2903
7-10-79	15	1	3	2	5	D2	17.3	56																			56	808
7-10-79	15	1	3	1	5	D2	17.8	135																			135	304
7-10-79	15	1	2	3	5	D2	17.7	19																			19	304
7-10-79	15	2	8	3	5	D2	17.6																				0	1119
7-18-79	16	1	2	3	5	D2	18.0	999																			999	95
7-18-79	16	1	3	2	5	D2	18.0	73						28													101	14
7-18-79	16	1	9	3	5	D2	18.0	27						13													40	27
7-18-79	16	1	2	3	5	N1	18.0	873																			873	1079
7-18-79	16	1	3	2	5	N1	18.0	486																			486	1661
7-18-79	16	1	9	3	5	N1	18.0	403						145													548	0
7-19-79	16	1	2	3	5	N2	18.0	1702															25				1727	1786
7-19-79	16	1	3	2	5	N2	18.0	864															24				888	2378
7-19-79	16	1	9	3	5	N2	18.0	2154																			2154	1763
7-19-79	16	1	2	3	5	D1	18.0	156																			156	35
7-19-79	16	1	3	2	5	D1	18.0	116						16													132	150
7-19-79	16	1	9	3	5	D1	18.0	80						32													112	16
7-26-79	17	1	2	3	5	D2	21.0	88						33													121	212
7-26-79	17	1	3	2	5	D2	21.0	290						30													320	555
7-26-79	17	1	9	3	5	D2	21.0	24																			24	25
7-26-79	17	1	2	3	5	N1	21.0	1148						37			37										1222	3946
7-26-79	17	1	3	2	5	N1	21.0	2606									36										2642	4253
7-26-79	17	1	9	3	5	N1	21.0	1530																			1530	2636
7-27-79	17	1	2	3	5	N2	21.0	1478						60													1538	15124
7-27-79	17	1	3	1	5	N2	21.0	1698						20													1718	17819
7-27-79	17	1	3	2	5	N2	21.0	1362						46													1408	20567
7-27-79	17	1	9	3	5	N2	21.0	1428																			1428	16139
7-27-79	17	1	2	3	5	D1	21.0	148																			148	479
7-27-79	17	1	3	1	5	D1	21.0	51																			51	710

Appendix 5. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	Dl	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
7-27-79	17	1	3	2	5	D1	21.0	510																			510	1253
7-27-79	17	1	9	3	5	D1	21.0	129																			129	472
8-01-79	18	1	2	3	5	N1	21.0	252						75													327	1346
8-01-79	18	1	3	1	5	N1	21.0	390																			390	2229
8-01-79	18	1	3	2	5	N1	21.0	452																			452	1698
8-01-79	18	1	9	3	5	N1	21.0	349						116													465	1879
8-02-79	18	1	2	3	5	N2	18.0	592	61					20									61				734	48720
8-02-79	18	1	3	1	5	N2	18.0	921	67					45													1033	47583
8-02-79	18	1	3	2	5	N2	18.0	238																			238	37528
8-02-79	18	1	9	3	5	N2	18.0	276		42				43									21				382	37587
8-02-79	18	1	2	3	5	D1	19.0	101	14					14													129	4667
8-02-79	18	1	3	1	5	D1	19.0	32																			32	2522
8-02-79	18	1	3	2	5	D1	19.0	220																			220	3034
8-02-79	18	1	9	3	5	D1	19.0	36																			36	6405
8-02-79	18	1	2	3	5	D2	22.0	61	12					12													85	239
8-02-79	18	1	3	1	5	D2	22.0	243																			243	248
8-02-79	18	1	3	2	5	D2	22.0	115						16													131	101
8-02-79	18	1	9	3	5	D2	22.0	56						14													70	226
8-06-79	19	3	3	2	5	LN	24.3	39	13																		52	26
8-06-79	19	1	3	1	5	N1	24.3	66	66																		132	333
8-06-79	19	1	2	3	5	N1	24.2	375	111																		486	531
8-06-79	19	1	9	3	5	N1	24.2	114																			114	0
8-07-79	19	1	3	1	5	N2	24.4	152						19													171	77
8-07-79	19	1	2	3	5	N2	24.6	70	14			14		14									14				126	84
8-07-79	19	1	9	3	5	N2	24.5	88	22					22													132	88
8-07-79	19	1	2	3	5	D1	23.8	20																			20	20
8-07-79	19	1	9	3	5	D1	23.8																				0	0
8-07-79	19	1	3	1	5	D2	24.3	233																			233	0
8-07-79	19	1	2	3	5	D2	24.3	99																			99	0
8-07-79	19	1	9	3	5	D2	24.3	16																			16	0
8-15-79	20	1	2	3	5	N1	19.0	190						27													217	0
8-15-79	20	1	3	1	5	N1	19.0	229																			229	38
8-15-79	20	1	9	3	5	N1	19.0																				0	28
8-16-79	20	1	2	3	5	N2	19.0	40																			40	639
8-16-79	20	1	3	1	5	N2	19.0	134					19	19													172	99
8-16-79	20	1	3	2	5	N2	19.0	196																			196	28
8-16-79	20	1	9	3	5	N2	19.0	120	20	20				40													200	323
8-16-79	20	1	2	3	5	D1	19.0																				0	47
8-16-79	20	1	3	1	5	D1	19.0							15													15	15
8-16-79	20	1	3	2	5	D1	19.0	42																			42	63
8-16-79	20	1	9	3	5	D1	19.0																				0	246
8-16-79	20	1	2	3	5	D2	20.0	97																			97	0
8-16-79	20	1	3	1	5	D2	20.0	109																			109	74
8-16-79	20	1	3	2	5	D2	20.0	33																			33	0
8-16-79	20	1	9	3	5	D2	20.0	60						36													96	72

Appendix 5. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	Dl	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
8-16-79	20	2	2	3	5	LN	20.0	99																			99	0
8-16-79	20	2	3	1	5	LN	20.0	70	31																		101	43
8-16-79	20	2	3	2	5	LN	20.0	70						14			14										98	43
8-16-79	20	2	9	3	5	LN	20.0	65						26													91	80
8-17-79	20	2	2	3	5	LD	20.0																9				9	56
8-17-79	20	2	3	1	5	LD	20.0																				0	18
8-17-79	20	2	3	2	5	LD	20.0	36																			36	48
8-17-79	20	2	9	3	5	LD	20.0																				0	18
8-22-79	21	1	2	3	5	D1	19.0																				0	0
8-22-79	21	1	3	1	5	D1	19.0																				0	0
8-22-79	21	1	3	2	5	D1	19.0																				0	0
8-22-79	21	1	9	3	5	D1	19.0	18																			18	0
8-22-79	21	1	2	3	5	D2	20.0																				0	0
8-22-79	21	1	3	1	5	D2	20.0																				0	0
8-22-79	21	1	3	2	5	D2	20.0																				0	0
8-22-79	21	1	9	3	5	D2	20.0																				0	0
8-22-79	21	1	2	3	5	N1	20.0																				0	0
8-22-79	21	1	3	1	5	N1	20.0																				0	0
8-22-79	21	1	3	2	5	N1	20.0																				0	0
8-22-79	21	1	9	3	5	N1	20.0							21													21	0
8-23-79	21	1	2	3	5	N2	19.0																				0	0
8-23-79	21	1	3	1	5	N2	19.0	14																			14	0
8-23-79	21	1	3	2	5	N2	19.0																				0	0
8-23-79	21	1	9	3	5	N2	19.0																				0	0
8-23-79	21	2	2	3	5	LD	20.0	7																			7	0
8-23-79	21	2	3	1	5	LD	20.0	8																			8	8
8-23-79	21	2	3	2	5	LD	20.0																				0	0
8-23-79	21	2	9	3	5	LD	20.0	14																			14	0
8-23-79	21	2	2	3	5	LN	20.0	14																			14	15
8-23-79	21	2	3	1	5	LN	20.0	8																			8	0
8-23-79	21	2	3	2	5	LN	20.0	11																			11	0
8-23-79	21	2	9	3	5	LN	20.0	8		8																	16	0
8-30-79	22	1	2	3	5	D2	21.0																				0	0
8-30-79	22	1	3	1	5	D2	21.0																				0	0
8-30-79	22	1	3	2	5	D2	21.0																				0	0
8-30-79	22	1	9	3	5	D2	21.0																				0	0
8-30-79	22	1	2	3	5	N1	23.0																				0	0
8-30-79	22	1	3	1	5	N1	23.0																				0	0
8-30-79	22	1	3	2	5	N1	23.0																				0	0
8-30-79	22	1	9	3	5	N1	23.0																				0	0
8-31-79	22	1	2	3	5	N2	21.5																				0	0
8-31-79	22	1	3	1	5	N2	21.5																				0	0
8-31-79	22	1	3	2	5	N2	21.5																				0	0
8-31-79	22	1	9	3	5	N2	21.5																				0	0
8-31-79	22	1	2	3	5	D1	22.0																				0	0
8-31-79	22	1	3	1	5	D1	22.0																				0	0

Appendix 5. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	D1	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
8-31-79	22	1	3	2	5	D1	22.0																				0	0
8-31-79	22	1	9	3	5	D1	22.0																				0	0
8-31-79	22	2	2	3	5	D2	23.0																				0	0
8-31-79	22	2	3	1	5	D2	23.0					16															16	0
8-31-79	22	2	3	2	5	D2	23.0																				0	0
8-31-79	22	2	9	3	5	D2	23.0																				0	0
8-31-79	22	2	2	3	5	LN	22.0	10																			10	0
8-31-79	22	2	3	1	5	LN	22.0																				0	0
8-31-79	22	2	3	2	5	LN	22.0																				0	0
8-31-79	22	2	9	3	5	LN	22.0																				0	0
9-01-79	22	2	2	3	5	D1	22.0																				0	0
9-01-79	22	2	3	1	5	D1	22.0																				0	0
9-01-79	22	2	3	2	5	D1	22.0																				0	0
9-01-79	22	2	9	3	5	D1	22.0																				0	0
9-10-79	23	1	3	2	5	N1	22.0	34																			34	0
9-10-79	23	1	3	1	5	N1	21.0	64																			64	0
9-10-79	23	1	2	3	5	N1	20.2																				0	0
9-10-79	23	2	8	3	5	N1	21.1	40																			40	0
9-11-79	23	1	3	2	5	N2	21.3																				0	0
9-11-79	23	3	3	1	5	N2	20.8																				0	0
9-11-79	23	1	2	3	5	N2	20.2	25																			25	0
9-11-79	23	1	9	3	5	N2	20.7	14																			14	14
9-11-79	23	1	3	2	5	D1	21.4	27																			27	0
9-11-79	23	1	3	1	5	D1	20.5	25																			25	25
9-11-79	23	1	2	3	5	D1	20.1																				0	0
9-11-79	23	1	9	3	5	D1	20.7																				0	0
9-11-79	23	1	3	1	5	D2	21.0																				0	0
9-11-79	23	1	2	3	5	D2	20.0																				0	0
9-11-79	23	1	9	3	5	D2	20.6	13																			13	0
9-25-79	24	1	3	1	5	N1	18.0	22																			22	0
9-25-79	24	1	2	3	5	N1	18.0	70																			70	0
9-25-79	24	1	9	3	5	N1	18.0	42																			42	0
9-26-79	24	1	3	2	5	N2	19.0	37																			37	0
9-26-79	24	1	3	1	5	N2	18.0	38																			38	0
9-26-79	24	1	2	3	5	N2	18.0	34																			34	0
9-26-79	24	1	9	3	5	N2	18.3	32																			32	0
9-26-79	24	1	3	2	5	D1	18.0																				0	0
9-26-79	24	1	3	1	5	D1	17.0																				0	0
9-26-79	24	1	2	3	5	D1	17.0																				0	0
9-26-79	24	1	9	3	5	D1	17.3																				0	0
9-26-79	24	1	3	2	5	D2	19.0																				0	0
9-26-79	24	1	3	1	5	D2	19.0																				0	0
9-26-79	24	1	2	3	5	D2	19.0																				0	0
9-26-79	24	1	9	3	5	D2	19.0																				0	0
10-08-79	25	1	3	1	5	N1	16.9																				0	0

Appendix 5. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	Dl	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
10-08-79	25	1	3	2	5	N1	18.0																				0	0
10-08-79	25	1	2	3	5	N1	17.4																				0	0
10-08-79	25	1	9	3	5	N1	16.3																				0	23
10-08-79	25	3	3	1	5	N2	16.2																				0	0
10-08-79	25	3	3	2	5	N2	16.1																				0	0
10-08-79	25	1	2	3	5	N2	16.6	14																			14	0
10-08-79	25	1	9	3	5	N2	16.3																				0	0
10-09-79	25	1	3	1	5	D1	15.6																				0	0
10-09-79	25	1	2	3	5	D1	16.0																				0	0
10-09-79	25	1	9	3	5	D1	15.8																				0	0
10-09-79	25	1	3	1	5	D2	15.0																				0	0
10-09-79	25	1	2	3	5	D2	15.3	54																			54	0
10-09-79	25	1	9	3	5	D2	15.2																				0	0
10-10-79	25	1	3	1	5	N2	15.5																				0	0
10-16-79	26	1	3	1	5	N1	18.0					38															38	0
10-16-79	26	1	3	2	5	N1	18.0																				0	0
10-16-79	26	1	2	3	5	N1	18.0	16																			16	0
10-16-79	26	1	9	3	5	N1	18.0																				0	0
10-17-79	26	1	3	1	5	N2	15.0	20																			20	0
10-17-79	26	1	3	2	5	N2	15.0	34																			34	0
10-17-79	26	1	2	3	5	N2	15.0																				0	0
10-17-79	26	1	9	3	5	N2	15.0	32																			32	0
10-17-79	26	1	3	1	5	D1	16.0																				0	0
10-17-79	26	1	3	2	5	D1	16.0																				0	0
10-17-79	26	1	2	3	5	D1	16.0																				0	0
10-17-79	26	1	9	3	5	D1	16.0																				0	0
10-17-79	26	1	3	1	5	D2	16.5																				0	0
10-17-79	26	1	3	2	5	D2	16.5																				0	0
10-17-79	26	1	2	3	5	D2	16.5																				0	0
10-17-79	26	1	9	3	5	D2	16.5																				0	0
11-12-79	27	1	3	1	5	N1	9.5																				0	0
11-12-79	27	1	3	2	5	N1	9.5																				0	0
11-12-79	27	1	2	3	5	N1	9.7	17																			17	0
11-12-79	27	1	9	3	5	N1	9.6																				0	0
11-13-79	27	1	3	1	5	N2	9.5																				0	0
11-13-79	27	1	3	2	5	N2	9.5																				0	0
11-13-79	27	1	2	3	5	N2	9.7																				0	0
11-13-79	27	1	9	3	5	N2	9.6																				0	0
11-13-79	27	1	3	1	5	D1	9.5																				0	0
11-13-79	27	1	3	2	5	D1	9.3																				0	0
11-13-79	27	1	2	3	5	D1	9.7																				0	0
11-13-79	27	1	9	3	5	D1	9.5																				0	0
11-13-79	27	1	3	1	5	D2	9.3																				0	0
11-13-79	27	1	3	2	5	D2	9.0																				0	0
11-13-79	27	1	2	3	5	D2	9.2																				0	0
11-13-79	27	1	9	3	5	D2	9.2																				0	0

Appendix 5. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	D1	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
11-28-79	28	1	3	1	5	N1	6.6																				0	0
11-28-79	28	1	3	2	5	N1	6.3																				0	0
11-28-79	28	1	2	3	5	N1	6.8																				0	0
11-28-79	28	2	8	3	5	N1	6.5																				0	0
11-29-79	28	1	3	1	5	N2	6.7																				0	0
11-29-79	28	1	3	2	5	N2	6.2																				0	0
11-29-79	28	1	2	3	5	N2	6.8																				0	0
11-29-79	28	2	8	3	5	N2	6.4																				0	0
11-29-79	28	1	3	1	5	D1	6.5																				0	0
11-29-79	28	1	3	2	5	D1	6.2																				0	0
11-29-79	28	2	8	3	5	D1	6.3																				0	0
11-28-79	28	1	3	1	5	D2	7.7																				0	0
11-28-79	28	1	3	2	5	D2	7.8																				0	0
11-28-79	28	1	2	3	5	D2	7.9																				0	0
11-28-79	28	1	9	3	5	D2	7.8																				0	0
12-10-79	29	1	3	1	5	N1	3.8																				0	0
12-10-79	29	1	3	2	5	N1	4.0																				0	0
12-10-79	29	1	2	3	5	N1	4.0																				0	0
12-10-79	29	1	9	3	5	N1	3.9																				0	0
12-11-79	29	1	3	1	5	N2	4.1																				0	0
12-11-79	29	1	3	2	5	N2	4.1																				0	0
12-11-79	29	1	2	3	5	N2	4.0																				0	0
12-11-79	29	1	9	3	5	N2	4.5																				0	0
12-11-79	29	1	3	1	5	D1	4.7																				0	0
12-11-79	29	1	3	2	5	D1	4.5																				0	0
12-11-79	29	1	2	3	5	D1	5.0																				0	0
12-11-79	29	1	9	3	5	D1	4.7																				0	0
12-11-79	29	1	3	1	5	D2	4.1																				0	0
12-11-79	29	1	3	2	5	D2	4.6																				0	0
12-11-79	29	1	2	3	5	D2	4.1																				0	0
12-11-79	29	1	9	3	5	D2	4.2																				0	0
12-19-79	30	1	3	1	5	N1	4.5																				0	0
12-19-79	30	1	3	2	5	N1	4.5																				0	0
12-19-79	30	1	2	3	5	N1	4.5																				0	0
12-19-79	30	1	9	3	5	N1	4.5																				0	0
12-20-79	30	1	3	1	5	N2	4.5																				0	0
12-20-79	30	1	3	2	5	N2	4.5																				0	0
12-20-79	30	1	2	3	5	N2	4.5																				0	0
12-20-79	30	1	9	3	5	N2	4.5																				0	0
12-20-79	30	1	3	1	5	D1	4.5																				0	0
12-20-79	30	1	3	2	5	D1	4.5																				0	0
12-20-79	30	1	2	3	5	D1	4.5																				0	0
12-20-79	30	1	9	3	5	D1	4.5																				0	0
12-19-79	30	1	3	1	5	D2	4.0																				0	0
12-19-79	30	1	3	2	5	D2	4.0																				0	0

Appendix 5. Continued.

Sample parameters								Species/groups																				
Date	Mpd	Ser	Grt	N/S	Dpt	D1	Temp C	AL	SP	SM	YP	TP	JD	XP	SS	MS	CP	NS	FS	QL	BR	UC	XM	XC	XE	XX	Total larvae	Eggs
12-19-79	30	1	2	3	5	D2	4.0																				0	0
12-19-79	30	1	9	3	5	D2	4.0																				0	0

Appendix 6. Densities (no./1,000 m^3) for fish eggs and larvae collected at beach (A, B, F) and open water (C, D, G, H, E, M) stations in Cook Plant study areas, southeastern Lake Michigan, 1973.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
3-16-73	D	A	O	8.0													O	O
3-16-73	D	A	O	8.0													O	O
3-15-73	N	A	O	8.2													O	O
3-15-73	N	A	O	8.2													O	O
3-16-73	D	B	O	8.0													O	O
3-16-73	D	B	O	8.0													O	O
3-14-73	N	B	O	10.0													O	O
3-14-73	N	B	O	10.0													O	O
4-13-73	D	A	O	7.5													O	39484
4-13-73	D	A	O	7.5													O	O
4-18-73	N	A	O	9.7													O	O
4-18-73	N	A	O	9.7													O	3147
4-13-73	D	B	O	8.1													O	O
4-13-73	D	B	O	8.1													O	O
4-19-73	N	B	O	9.9													O	O
4-19-73	N	B	O	9.9													O	572
4-13-73	D	F	O	8.8													O	O
4-13-73	D	F	O	8.8													O	O
4-18-73	N	F	O	9.5													O	1144
4-18-73	N	F	O	9.5													O	O
5-18-73	D	A	O	12.5													O	O
5-18-73	D	A	O	12.5			670										670	O
5-17-73	N	A	O	10.7			286										286	572
5-17-73	N	A	O	10.7			286	286									572	2002
5-18-73	D	B	O	12.5													O	5627
5-18-73	D	B	O	12.5													O	26760
5-17-73	N	B	O	10.7													O	O
5-17-73	N	B	O	10.7													O	O

Appendix 6. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
5-18-73	D	F	0	12.1													0	0
5-18-73	D	F	0	12.1													0	0
5-18-73	N	F	0	11.9													0	0
5-18-73	N	F	0	11.9													0	0
6-19-73	D	A	0	23.5	16878												16878	0
6-19-73	D	A	0	23.5	4862												4862	0
6-19-73	N	A	0	22.5	2860												2860	0
6-19-73	N	A	0	22.5	4004	286											4290	0
6-19-73	D	B	0	24.5	1430												1430	3147
6-19-73	D	B	0	24.5	2860	858											3718	54077
6-19-73	N	B	0	22.0	2288	1430											3718	21745
6-19-73	N	B	0	22.0	2002	2574	286										4862	98140
6-19-73	D	F	0	24.0	4290												4290	0
6-19-73	D	F	0	24.0	2574												2574	0
6-20-73	N	F	0	22.0	2574	2574											5148	6580
6-20-73	N	F	0	22.0	2288	3718											6006	13733
7-19-73	D	A	0	23.0	2574												2574	5436
7-19-73	D	A	0	23.0	6006												6006	572
7-20-73	N	A	0	21.8	9724												9724	90128
7-20-73	N	A	0	21.8	10010	286											10296	115021
7-19-73	D	B	0	24.4	53208												53208	0
7-19-73	D	B	0	24.4	7436												7436	2288
7-20-73	N	B	0	21.5	8581	858											9439	2575
7-20-73	N	B	0	21.5	6006	286											6292	2288
7-19-73	D	F	0	25.3	4004												4004	3719
7-19-73	D	F	0	25.3	4576												4576	2002
7-20-73	N	F	0	25.3	13731												13731	3092990
7-20-73	N	F	0	25.3	9441	572											10013	3445207

Appendix 6. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
8-09-73	D	A	0	26.0	11921												11921	0
8-09-73	D	A	0	26.0	2706												2706	0
8-08-73	N	A	0	24.5	1934												1934	2213
8-08-73	N	A	0	24.5	1062												1062	0
8-09-73	D	B	0	26.8	3771												3771	314
8-09-73	D	B	0	26.8	2603												2603	0
8-08-73	N	B	0	24.5													0	1246
8-08-73	N	B	0	24.5	848												848	0
8-09-73	D	F	0	27.0	11154												11154	572
8-09-73	D	F	0	27.0	21166												21166	286
8-09-73	N	F	0	23.8	1400	280											1680	560
8-09-73	N	F	0	23.8	478												478	239
9-07-73	D	A	0	22.0													0	0
9-07-73	D	A	0	22.0													0	0
9-07-73	N	A	0	23.4													0	0
9-07-73	N	A	0	23.4													0	5150
9-07-73	D	B	0	22.4													0	286
9-07-73	D	B	0	22.4													0	286
9-06-73	N	B	0	23.4													0	0
9-06-73	N	B	0	23.4													0	0
9-07-73	D	F	0	21.6													0	0
9-07-73	D	F	0	21.6													0	0
9-06-73	N	F	0	24.0	286												286	0
9-06-73	N	F	0	24.2													0	12017
10-10-73	D	A	0	18.6													0	0
10-10-73	D	A	0	18.6													0	0
10-10-73	N	A	0	17.8													0	0
10-10-73	N	A	0	17.8													0	0

Appendix 6. Continued.

Sample Parameters					Species/Groups													
Date	DI	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
10-10-73	D	B	0	19.3													0	0
10-10-73	D	B	0	19.3													0	0
10-10-73	N	B	0	17.6													0	0
10-10-73	N	B	0	17.6													0	0
10-10-73	D	F	0	18.0													0	0
10-10-73	D	F	0	18.0													0	0
10-10-73	N	F	0	17.9													0	0
10-10-73	N	F	0	17.9													0	0
11-15-73	D	A	0	9.5													0	0
11-15-73	D	A	0	9.5													0	0
11-14-73	N	A	0	10.0													0	0
11-14-73	N	A	0	10.0													0	0
11-15-73	D	B	0	10.3													0	0
11-15-73	D	B	0	10.3													0	0
11-14-73	N	B	0	10.7													0	0
11-14-73	N	B	0	10.7													0	0
11-14-73	N	F	0	11.0													0	0
11-14-73	N	F	0	11.0													0	0
4-26-73	D	C	0	7.0													0	0
4-26-73	D	C	1	7.0													0	0
4-26-73	D	C	2	7.0													0	0
4-26-73	D	C	3	7.2													0	0
4-29-73	N	C	0	6.4			147										147	0
4-29-73	N	C	1	6.4			73										73	0
4-29-73	N	C	2	6.4			92										92	0
4-29-73	N	C	3	6.2													0	0
4-26-73	D	D	0	7.0													0	0
4-26-73	D	D	1	7.0													0	0
4-26-73	D	D	2	7.0													0	0
4-26-73	D	D	4	7.2													0	0
4-29-73	N	D	0	7.0			285										285	0
4-29-73	N	D	1	7.0			314										314	0
4-29-73	N	D	2	7.0			122										122	0
4-29-73	N	D	4	7.0			207										207	0

Appendix 6. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
4-26-73	D	G	0	7.2													0	0
4-26-73	D	G	1	7.2													0	0
4-26-73	D	G	2	7.2													0	0
4-26-73	D	G	4	7.6													0	0
4-28-73	N	G	0	7.7			332										332	0
4-28-73	N	G	1	7.7			856									XX: 53	909	0
4-28-73	N	G	2	7.7			1398										1398	0
4-28-73	N	G	3	7.5			524	56									580	0
4-26-73	D	H	0	7.4													0	0
4-26-73	D	H	1	7.4													0	0
4-26-73	D	H	2	7.4													0	0
4-26-73	D	H	4	6.8													0	0
4-28-73	N	H	0	7.4													0	0
4-28-73	N	H	1	7.4			294										294	0
4-28-73	N	H	2	7.4			174										174	0
4-28-73	N	H	4	7.0			91										91	0
5-15-73	D	C	0	11.8													0	0
5-15-73	D	C	1	11.8			54										54	0
5-15-73	D	C	2	11.8													0	0
5-15-73	D	C	3	10.7													0	0
5-15-73	N	C	0	10.7													0	0
5-15-73	N	C	1	10.7													0	0
5-15-73	N	C	2	10.7													0	0
5-15-73	N	C	3	11.9													0	0
5-15-73	D	D	0	11.3													0	0
5-15-73	D	D	1	11.3													0	0
5-15-73	D	D	2	11.3													0	0
5-15-73	D	D	4	10.1													0	0
5-15-73	N	D	0	10.3			85										85	0
5-15-73	N	D	1	10.3													0	0
5-15-73	N	D	2	10.3													0	0
5-15-73	N	D	4	9.3													0	0

Appendix 6. Continued.

Sample Parameters					Species/Groups													
Date	DI	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
5-15-73	D	G	0	10.8													0	0
5-15-73	D	G	1	10.8													0	0
5-15-73	D	G	2	10.8													0	0
5-15-73	D	G	3	10.2													0	0
5-15-73	N	G	0	10.2													0	0
5-15-73	N	G	1	10.2													0	0
5-15-73	N	G	2	10.2													0	0
5-15-73	N	G	3	10.2													0	0
5-15-73	D	H	0	10.9													0	0
5-15-73	D	H	1	10.9													0	0
5-15-73	D	H	2	10.9													0	0
5-15-73	D	H	4	10.1													0	0
5-15-73	N	H	0	9.9													0	0
5-15-73	N	H	1	9.9													0	0
5-15-73	N	H	2	9.9													0	0
5-15-73	N	H	4	9.4													0	0
5-15-73	D	M	0	11.4													0	0
5-15-73	D	M	1	11.4													0	0
5-15-73	D	M	2	11.4													0	0
5-15-73	D	M	3	11.4													0	0
6-19-73	D	C	0	21.0	3290												3290	0
6-19-73	D	C	1	21.0	11371												11371	0
6-19-73	D	C	2	21.0	2223												2223	0
6-19-73	D	C	3	22.0	993												993	0
6-19-73	N	C	0	20.8	5061			76									5137	767
6-19-73	N	C	1	20.8	2258												2258	754
6-19-73	N	C	2	20.8	4825	188											5013	189
6-19-73	N	C	3	20.8	6940	187		187									7314	0
6-19-73	D	D	0	21.2	643												643	0
6-19-73	D	D	1	21.2	7489			291									7780	194
6-19-73	D	D	2	21.2	2050			246									2296	0
6-19-73	D	D	4	18.5	260												260	0
6-19-73	N	D	0	21.5	2181												2181	128
6-19-73	N	D	1	21.5	1335			68									1403	0
6-19-73	N	D	2	21.5	1993												1993	0
6-19-73	N	D	4	16.5	1120	210											1330	0

Appendix 6. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
6-19-73	D	E	0	19.5	67												67	0
6-19-73	D	E	1	19.5	100												100	0
6-19-73	D	E	2	19.5	776												776	0
6-19-73	D	E	7	7.2	60												60	0
6-18-73	D	G	0	21.3	949												949	0
6-18-73	D	G	1	21.3	593												593	222
6-18-73	D	G	2	21.3	637												637	0
6-18-73	D	G	3	19.0	1584												1584	0
6-18-73	N	G	0	20.5	8923			141									9064	42523
6-18-73	N	G	1	20.5	5353												5353	6539
6-18-73	N	G	2	20.5	3515												3515	0
6-18-73	N	G	3	19.2	3873												3873	10787
6-18-73	D	H	0	20.2	498												498	0
6-18-73	D	H	1	20.2	360												360	0
6-18-73	D	H	2	20.2	348												348	0
6-18-73	D	H	4	18.5	379												379	0
6-18-73	N	H	0	21.5	1598												1598	92
6-18-73	N	H	1	21.5	4979												4979	46743
6-18-73	N	H	2	21.5	1110												1110	333
6-18-73	N	H	4	16.3	2041												2041	0
7-17-73	D	C	0	22.0													0	0
7-17-73	D	C	1	22.0													0	0
7-17-73	D	C	2	22.0	392												392	0
7-17-73	D	C	4	21.2	1112												1112	0
7-17-73	N	C	0	22.6	1598												1598	0
7-17-73	N	C	1	22.6	3105												3105	0
7-17-73	N	C	2	22.6	2907												2907	0
7-17-73	N	C	3	22.4	295												295	0
7-17-73	D	D	0	21.1													0	0
7-17-73	D	D	1	21.1													0	0
7-17-73	D	D	2	21.1	644												644	0
7-17-73	D	D	4	18.2	708												708	0
7-17-73	N	D	0	20.5	2180												2180	0
7-17-73	N	D	1	20.5	1236												1236	0
7-17-73	N	D	2	20.5	967												967	0
7-17-73	N	D	4	15.5	485												485	0

Appendix 6. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
7-16-73	D	E	0	21.0	480												480	0
7-16-73	D	E	1	21.0													0	0
7-16-73	D	E	2	21.0	141												141	0
7-16-73	D	E	7	17.9	560												560	0
7-16-73	D	G	0	22.2	82												82	0
7-16-73	D	G	1	22.2	1129												1129	0
7-16-73	D	G	2	22.2	570												570	0
7-16-73	D	G	3	22.2	1105												1105	0
7-16-73	N	G	0	22.6	529												529	0
7-16-73	N	G	1	22.6	315												315	0
7-16-73	N	G	2	22.6	742												742	0
7-16-73	N	G	3	19.9	579												579	0
7-16-73	D	H	0	22.5	720												720	0
7-16-73	D	H	1	22.5	190												190	0
7-16-73	D	H	2	22.5	236												236	0
7-16-73	D	H	4	22.0													0	0
7-16-73	N	H	0	21.8	165												165	0
7-16-73	N	H	1	21.8	540												540	0
7-16-73	N	H	2	21.8	668												668	0
7-16-73	N	H	4	18.2	535												535	0
8-22-73	D	C	0	11.3													0	0
8-22-73	D	C	1	11.3													0	0
8-22-73	D	C	2	11.3													0	0
8-22-73	D	C	3	9.2													0	0
8-21-73	N	C	0	14.3													0	0
8-21-73	N	C	1	14.3													0	0
8-21-73	N	C	2	14.3													0	0
8-21-73	N	C	3	12.2													0	0
8-22-73	D	D	0	11.3													0	0
8-22-73	D	D	1	11.3			67										67	0
8-22-73	D	D	2	11.3													0	0
8-22-73	D	D	4	8.5													0	0
8-21-73	N	D	0	11.3													0	0
8-21-73	N	D	1	11.3													0	0
8-21-73	N	D	2	11.3													0	0
8-21-73	N	D	4	8.5													0	0

Appendix 6. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
8-22-73	D	E	0	14.0	98												98	0
8-22-73	D	E	1	14.0	414												414	0
8-22-73	D	E	2	14.0													0	231
8-22-73	D	E	7	6.5													0	0
8-22-73	D	G	0	16.5													0	0
8-22-73	D	G	1	16.5													0	0
8-22-73	D	G	2	16.5	57												57	0
8-22-73	D	G	3	12.4													0	355
8-22-73	N	G	0	14.9	368												368	0
8-22-73	N	G	1	14.9	88												88	0
8-22-73	N	G	2	14.9													0	0
8-22-73	N	G	3	16.3													0	0
8-22-73	D	H	0	17.0													0	0
8-22-73	D	H	1	17.0	133												133	0
8-22-73	D	H	2	17.0													0	0
8-22-73	D	H	4	15.8													0	0
8-22-73	N	H	0	17.0													0	0
8-22-73	N	H	1	17.0													0	0
8-22-73	N	H	2	17.0	644												644	0
8-22-73	N	H	4	15.8	184												184	0
8-21-73	N	M	0	14.0													0	0
8-21-73	N	M	1	14.0													0	0
8-21-73	N	M	2	14.0													0	0
8-21-73	N	M	3	10.0													0	0
9-18-73	D	C	0	13.0													0	0
9-18-73	D	C	1	13.0													0	0
9-18-73	D	C	2	13.0													0	0
9-18-73	D	C	3	12.0													0	0
9-19-73	N	C	0	13.9													0	0
9-18-73	N	C	1	13.9													0	0
9-18-73	N	C	2	13.9													0	0
9-18-73	N	C	3	13.6													0	0

Appendix 6. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
9-18-73	D	D	0	12.5													0	0
9-18-73	D	D	1	12.5													0	0
9-18-73	D	D	2	12.5													0	0
9-18-73	D	D	4	9.0													0	0
9-18-73	N	D	0	14.2													0	0
9-18-73	N	D	1	14.2													0	0
9-18-73	N	D	2	14.2													0	0
9-18-73	N	D	4	13.5													0	0
9-17-73	D	G	0	11.0													0	0
9-17-73	D	G	1	11.0													0	0
9-17-73	D	G	2	11.0													0	0
9-17-73	D	G	3	11.0													0	0
9-18-73	N	G	0	14.5													0	0
9-18-73	N	G	1	14.5													0	0
9-18-73	N	G	2	14.5													0	0
9-18-73	N	G	3	14.1													0	0
9-17-73	D	H	0	12.2													0	0
9-17-73	D	H	1	12.2													0	0
9-17-73	D	H	2	12.2													0	0
9-17-73	D	H	4	10.0													0	0
9-18-73	N	H	0	14.5													0	0
9-18-73	N	H	1	14.5													0	0
9-18-73	N	H	2	14.5													0	0
9-18-73	N	H	4	14.9													0	0
10-27-73	D	C	0	13.7													0	0
10-27-73	D	C	1	13.7													0	0
10-27-73	D	C	2	13.7													0	0
10-27-73	D	C	3	13.7													0	0
10-26-73	N	C	0	13.8													0	0
10-26-73	N	C	1	13.8													0	0
10-26-73	N	C	2	13.8													0	0
10-26-73	N	C	3	13.5													0	0

Appendix 6. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS,	FS	Misc.	Total Larvae	Eggs
10-26-73	D	D	0	15.7													0	0
10-26-73	D	D	1	15.7													0	0
10-26-73	D	D	2	15.7													0	0
10-26-73	D	D	4	14.9													0	0
10-26-73	N	D	0	13.9													0	0
10-26-73	N	D	1	13.9													0	0
10-26-73	N	D	2	13.9													0	0
10-26-73	N	D	4	13.9													0	0
10-26-73	D	E	0	99.9													0	0
10-26-73	D	E	1	99.9													0	0
10-26-73	D	E	2	99.9													0	0
10-26-73	D	E	4	99.9													0	0
10-26-73	D	G	0	15.1													0	0
10-26-73	D	G	1	15.1													0	0
10-26-73	D	G	2	15.1													0	0
10-26-73	D	G	3	15.1													0	0
10-26-73	N	G	0	14.2													0	0
10-26-73	N	G	1	14.2													0	0
10-26-73	N	G	2	14.2													0	0
10-26-73	N	G	3	14.5													0	0
10-26-73	D	H	0	14.9													0	0
10-26-73	D	H	1	14.9													0	0
10-26-73	D	H	2	14.9													0	0
10-26-73	D	H	4	14.3													0	0
10-26-73	N	H	0	14.6													0	0
10-26-73	N	H	1	14.6													0	0
10-26-73	N	H	2	14.6													0	0
10-26-73	N	H	4	14.6													0	0
10-26-73	D	M	0	14.5													0	0
10-26-73	D	M	1	14.5													0	0
10-26-73	D	M	2	14.5													0	0
10-26-73	D	M	3	14.5													0	0

Appendix 7. Densities (no./1,000 m^3) for fish eggs and larvae collected at beach (A, B, F) and open water (C, D, G, H, E) stations in Cook Plant study areas, southeastern Lake Michigan, 1974.

Sample Parameters					Species/Groups													
Date	DI	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
1-29-74	D	A	0	0.4													0	1939
1-29-74	D	A	0	0.4													0	1587
1-29-74	D	B	0	0.4													0	5000
1-29-74	D	B	0	0.4													0	873
3-15-74	D	A	0	4.8													0	0
3-15-74	D	A	0	4.8													0	0
3-06-74	N	A	0	6.2													0	0
3-06-74	N	A	0	6.2													0	0
3-15-74	D	B	0	3.8													0	0
3-15-74	D	B	0	3.8													0	0
3-06-74	N	B	0	6.2													0	0
3-06-74	N	B	0	6.2													0	0
3-15-74	D	F	0	3.5													0	0
3-15-74	D	F	0	3.7													0	0
3-14-74	N	F	0	4.2													0	0
3-14-74	N	F	0	4.2													0	0
4-18-74	D	A	1	12.0													0	0
4-03-74	D	A	0	10.2													0	0
4-24-74	D	A	0	11.0													0	588
4-09-74	D	A	0	5.5													0	0
4-18-74	D	A	1	12.0													0	0
4-03-74	D	A	0	10.2													0	0
4-24-74	D	A	0	11.0													0	172
4-09-74	D	A	0	5.5													0	0
4-20-74	N	A	1	7.4													0	0
4-20-74	N	A	1	7.4													0	0
4-09-74	D	B	0	5.5													0	238
4-03-74	D	B	0	10.2													0	0
4-18-74	D	B	1	11.5													0	0
4-03-74	D	B	0	10.2													0	0
4-09-74	D	B	0	5.5													0	0
4-18-74	D	B	1	11.5													0	0
4-20-74	N	B	1	7.1													0	0
4-20-74	N	B	1	7.1													0	0

Appendix 7. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
4-18-74	D	F	1	12.0													0	0
4-18-74	D	F	1	12.0													0	0
4-19-74	N	F	1	8.2													0	0
4-19-74	N	F	1	8.2													0	0
5-03-74	D	A	0	11.4			110										110	1325
5-03-74	D	A	0	11.5			104										104	1930
5-08-74	D	A	0	9.2			1041										1041	0
5-08-74	D	A	0	9.2			276										276	0
5-17-74	D	A	0	12.7													0	0
5-17-74	D	A	0	12.7													0	0
5-22-74	D	A	0	12.0													0	0
5-22-74	D	A	0	12.0													0	0
5-02-74	N	A	0	11.0			1632										1632	0
5-02-74	N	A	0	11.0			4285										4285	476
5-09-74	N	A	0	8.0													0	0
5-09-74	N	A	0	8.0			444										444	0
5-16-74	N	A	0	11.1			306										306	0
5-16-74	N	A	0	11.1			139										139	0
5-03-74	D	B	0	10.5			165										165	1490
5-03-74	D	B	0	10.5													0	1179
5-08-74	D	B	0	9.2			92										92	0
5-08-74	D	B	0	9.2			514										514	0
5-17-74	D	B	0	12.1			105										105	0
5-17-74	D	B	0	12.1													0	0
5-22-74	D	B	0	12.0			833										833	0
5-22-74	D	B	0	12.0													0	0
5-02-74	N	B	0	13.0													0	0
5-02-74	N	B	0	13.0			430										430	0
5-09-74	N	B	0	8.0			205										205	0
5-09-74	N	B	0	8.0			350										350	0
5-15-74	N	B	0	12.5			150										150	0
5-15-74	N	B	0	12.5			290										290	0

Appendix 7. Continued.

Sample Parameters					Species/Groups													
Date	DI	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
5-03-74	D	F	0	9.5													0	10340
5-03-74	D	F	0	9.5													0	14666
5-17-74	D	F	0	12.7			222										222	0
5-17-74	D	F	0	12.7			383										383	255
5-02-74	N	F	0	11.0													0	0
5-02-74	N	F	0	11.0													0	0
5-15-74	N	F	0	11.9			952										952	0
5-15-74	N	F	0	11.9			634										634	0
6-01-74	D	A	0	18.2													0	484
6-01-74	D	A	0	18.2													0	0
6-05-74	D	A	0	18.5		288											288	723
6-05-74	D	A	0	18.5		188											188	0
6-11-74	D	A	0	16.8	5668	195		391									6254	149951
6-11-74	D	A	0	16.8	3759												3759	123931
6-26-74	D	A	0	17.0													0	52991
6-26-74	D	A	0	17.0	516												516	146253
6-04-74	N	A	0	18.5		1629											1629	56884
6-04-74	N	A	0	18.5		3444											3444	2706
6-12-74	N	A	0	18.2	556	835										XX: 139	1530	418
6-12-74	N	A	0	18.2	1392	835		139									2366	0
6-25-74	N	A	0	13.1	65	65		65						65			260	348104
6-25-74	N	A	0	13.1					63								63	255427
6-01-74	D	B	0	18.8													0	582
6-01-74	D	B	0	18.8													0	350
6-05-74	D	B	0	18.5													0	9609
6-05-74	D	B	0	18.2		144											144	8532
6-11-74	D	B	0	16.5	3769												3769	19457
6-11-74	D	B	0	16.5	3317												3317	7843
6-26-74	D	B	0	17.5	322												322	5987
6-26-74	D	B	0	17.5	483												483	4692
6-04-74	N	B	0	18.0		625											625	57083
6-04-74	N	B	0	18.0		207											207	43064
6-12-74	N	B	0	18.0	951	475											1426	0
6-12-74	N	B	0	18.0	1743	316											2059	0
6-25-74	N	B	0	13.1		44										XX: 134	178	234458
6-25-74	N	B	0	13.1	123	41										XX: 41	205	354872

Appendix 7. Continued.

Sample Parameters					Species/Groups													
Date	DI	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
6-01-74	D	F	O	18.6													0	0
6-01-74	D	F	O	18.6	107												107	430
6-05-74	D	F	O	17.5													0	3023
6-05-74	D	F	O	17.5													0	2373
6-11-74	D	F	O	17.5	595												595	207380
6-11-74	D	F	O	17.5	266	399										XX: 133	798	110800
6-26-74	D	F	O	16.3	640												640	22756
6-26-74	D	F	O	16.0	641												641	104487
6-04-74	N	F	O	17.5		191											191	0
6-04-74	N	F	O	17.5	180	540											720	180
6-12-74	N	F	O	18.0	746	1045		298									2089	0
6-12-74	N	F	O	18.0	1045	895		597									2537	0
6-25-74	N	F	O	15.1	124	372											496	147538
6-25-74	N	F	O	15.2		70											70	28591
7-17-74	D	A	O	22.5	680												680	544
7-17-74	D	A	O	22.5	142												142	20469
7-24-74	D	A	O	16.2	185												185	0
7-24-74	D	A	O	16.2													0	0
7-08-74	N	A	O	24.0	5784												5784	141
7-08-74	N	A	O	24.0	7476												7476	0
7-11-74	N	A	O	20.4	2480	1240											3720	310
7-11-74	N	A	O	20.4	292	3227											3519	440
7-16-74	N	A	O	18.5	2632	1755											4387	1055
7-16-74	N	A	O	18.5	896	1152											2048	2692
7-22-74	N	A	O	16.0	792	396											1188	0
7-22-74	N	A	O	16.0	2082	1388											3470	347
7-17-74	D	B	O	22.0													0	196
7-17-74	D	B	O	22.0													0	1820
7-24-74	D	B	O	16.9	128												128	0
7-24-74	D	B	O	16.9													0	0
7-08-74	N	B	O	24.0	7225	141											7366	0
7-08-74	N	B	O	24.0	7367	282											7649	0
7-11-74	N	B	O	21.0	978	12251											13229	2450
7-11-74	N	B	O	21.0	833	11227											12060	4898
7-16-74	N	B	O	18.5	1082	540											1622	0
7-16-74	N	B	O	18.5	2219	1585											3804	634
7-22-74	N	B	O	15.9	529	5465											5994	0
7-22-74	N	B	O	15.9	1409	7052											8461	0

Appendix 7. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
7-08-74	D	F	0	24.0	1383	138											1521	277
7-08-74	D	F	0	24.0	830												830	0
7-17-74	D	F	0	20.2	625												625	3958
7-17-74	D	F	0	20.2	296	148											444	2222
7-24-74	D	F	0	18.0													0	606
7-24-74	D	F	0	18.0													0	0
7-17-74	N	F	0	19.0	1408	7049											8457	7692
7-17-74	N	F	0	19.0	1260	4914											6174	4410
7-22-74	N	F	0	16.1	951	950											1901	0
7-22-74	N	F	0	16.1	185	370											555	0
8-06-74	D	A	0	22.7													0	0
8-06-74	D	A	0	22.0													0	0
8-14-74	D	A	0	18.5	810												810	270
8-14-74	D	A	0	18.5	1215												1215	405
8-19-74	D	A	0	24.0													0	0
8-19-74	D	A	0	24.0	135												135	0
8-05-74	N	A	0	19.4	829	207											1036	207
8-05-74	N	A	0	19.4	829												829	0
8-14-74	N	A	0	17.7	206	827											1033	103
8-14-74	N	A	0	17.7	206	1343											1549	0
8-19-74	N	A	0	22.0	218	109											327	0
8-19-74	N	A	0	22.0	109	982											1091	0
8-06-74	D	B	0	22.2													0	0
8-06-74	D	B	0	22.2													0	0
8-14-74	D	B	0	19.4		130											130	0
8-14-74	D	B	0	19.4													0	0
8-19-74	D	B	0	24.0													0	0
8-19-74	D	B	0	24.0													0	0
8-05-74	N	B	0	19.7	381	381											762	383
8-05-74	N	B	0	19.7	764												764	0
8-14-74	N	B	0	17.0	375	5028											5403	0
8-14-74	N	B	0	16.8	153	6435											6588	0
8-19-74	N	B	0	22.0		2701											2701	1355
8-19-74	N	B	0	22.0	224	5637											5861	0

Appendix 7. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
8-06-74	D	F	0	23.5	108												108	108
8-06-74	D	F	0	22.5	649												649	0
8-14-74	D	F	0	19.0	226												226	2721
8-14-74	D	F	0	19.0	453	113											566	1814
8-19-74	D	F	0	23.0	695												695	0
8-19-74	D	F	0	23.0	556												556	0
8-05-74	N	F	0	20.3	405	675											1080	0
8-05-74	N	F	0	20.3	135	540											675	0
8-14-74	N	F	0	14.5		775											775	1087
8-15-74	N	F	0	14.5		1862											1862	2952
8-19-74	N	F	0	21.0		1134											1134	650
8-19-74	N	F	0	21.0		973											973	325
9-09-74	D	A	0	22.0	3735												3735	0
9-09-74	D	A	0	22.0	792												792	0
9-09-74	N	A	0	19.1													0	0
9-09-74	N	A	0	19.1	363												363	0
9-09-74	D	B	0	20.9	1064												1064	0
9-09-74	D	B	0	20.9	590												590	0
9-09-74	N	B	0	18.0		256											256	0
9-09-74	N	B	0	18.0	768	256											1024	0
9-09-74	D	F	0	21.3	375												375	0
9-09-74	D	F	0	21.3	500												500	0
9-09-74	N	F	0	18.0													0	0
9-09-74	N	F	0	18.0	166												166	0
10-09-74	D	A	0	14.5													0	0
10-09-74	D	A	0	14.5	696												696	0
10-08-74	N	A	0	13.3													0	0
10-08-74	N	A	0	13.3													0	0
10-09-74	D	B	0	14.8	266												266	0
10-09-74	D	B	0	14.8	133												133	0
10-08-74	N	B	0	12.8													0	0
10-08-74	N	B	0	12.8													0	0

Appendix 7. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
10-09-74	D	F	0	14.0													0	0
10-09-74	D	F	0	14.0													0	0
10-04-74	N	F	0	12.8													0	0
10-08-74	N	F	0	12.8													0	0
11-26-74	D	A	0	5.5													0	0
11-26-74	D	A	0	5.5													0	0
11-26-74	N	A	0	4.7													0	0
11-26-74	N	A	0	4.7													0	0
11-26-74	D	B	0	5.2													0	0
11-26-74	D	B	0	5.2													0	0
11-26-74	N	B	0	5.0													0	0
11-26-74	N	B	0	5.0													0	0
11-26-74	D	F	0	5.0													0	0
11-26-74	D	F	0	5.0													0	0
11-26-74	D	F	0	5.0													0	141
11-26-74	D	F	0	5.0													0	0
4-17-74	D	C	0	8.6													0	0
4-17-74	D	C	2	7.7													0	0
4-17-74	D	C	4	7.7													0	0
4-17-74	D	C	6	7.7													0	0
4-17-74	N	C	0	7.2													0	0
4-17-74	N	C	2	6.4													0	0
4-17-74	N	C	4	6.4													0	0
4-17-74	N	C	6	6.4													0	0
4-17-74	D	D	0	9.2													0	0
4-17-74	D	D	2	8.0													0	0
4-17-74	D	D	4	8.0													0	0
4-17-74	D	D	6	8.0													0	0
4-17-74	D	D	8	8.0													0	0
4-16-74	N	D	0	7.3													0	0
4-16-74	N	D	2	6.0													0	0
4-16-74	N	D	4	6.0													0	0
4-16-74	N	D	6	6.0													0	0
4-16-74	N	D	8	6.0													0	0

Appendix 7. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
4-16-74	D	G	0	8.8													0	0
4-16-74	D	G	2	7.4													0	0
4-16-74	D	G	4	7.4													0	0
4-16-74	D	G	6	7.4													0	0
4-16-74	N	G	0	8.0													0	0
4-16-74	N	G	2	7.6													0	0
4-16-74	N	G	4	7.6													0	0
4-16-74	N	G	6	7.6													0	0
4-16-74	D	H	0	7.0													0	0
4-16-74	D	H	2	7.0													0	0
4-16-74	D	H	4	7.0													0	0
4-16-74	D	H	6	7.0													0	0
4-16-74	D	H	8	7.0													0	0
4-16-74	N	H	0	7.9													0	0
4-16-74	N	H	2	6.4													0	0
4-16-74	N	H	4	6.4													0	0
4-16-74	N	H	6	6.4													0	0
4-16-74	N	H	8	6.4													0	0
5-13-74	D	C	0	9.5			309										309	0
5-13-74	D	C	2	9.1			232										232	0
5-13-74	D	C	4	9.1			51										51	0
5-13-74	D	C	6	9.1			127										127	0
5-14-74	N	C	0	9.2													0	0
5-14-74	N	C	2	8.8			324										324	0
5-14-74	N	C	4	8.8			247										247	0
5-14-74	N	C	6	8.8			371										371	0
5-13-74	D	D	0	9.2													0	0
5-13-74	D	D	2	9.0			53										53	0
5-13-74	D	D	4	9.0													0	0
5-13-74	D	D	6	9.0			185										185	0
5-13-74	D	D	8	9.0			199										199	0
5-13-74	N	D	0	9.3			215										215	0
5-13-74	N	D	2	8.4			248										248	0
5-13-74	N	D	4	8.4			740										740	0
5-13-74	N	D	6	8.4			183										183	0
5-13-74	N	D	8	8.4			144										144	0

Appendix 7. Continued.

Sample Parameters					Species/Groups													
Date	DI	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
5-14-74	D	G	0	10.5													0	0
5-14-74	D	G	2	10.1													0	0
5-14-74	D	G	4	10.1			63										63	0
5-14-74	D	G	6	10.1			144										144	0
5-13-74	N	G	0	9.8			50										50	0
5-13-74	N	G	2	9.3			110										110	0
5-13-74	N	G	4	9.3			688										688	0
5-13-74	N	G	6	9.3			51										51	0
5-14-74	D	H	0	10.0													0	0
5-14-74	D	H	2	9.9													0	0
5-14-74	D	H	4	9.9			157										157	0
5-14-74	D	H	6	9.9			154										154	0
5-14-74	D	H	8	9.9			89										89	0
5-13-74	N	H	0	9.5													0	0
5-13-74	N	H	2	8.9			226										226	0
5-13-74	N	H	4	8.9													0	0
5-13-74	N	H	6	8.9			135										135	0
5-13-74	N	H	8	8.9			135										135	0
6-12-74	D	C	0	17.6	49												49	0
6-12-74	D	C	2	17.6	4733			182									4915	0
6-12-74	D	C	4	17.6	1023												1023	0
6-12-74	D	C	6	16.4	120												120	0
6-12-74	N	C	0	14.2	4168	416		938									5522	1042
6-12-74	N	C	2	14.2	5212	91											5303	558
6-12-74	N	C	4	14.2	6557	91		91									6739	578
6-12-74	N	C	6	14.2	7524	59		59									7642	439
6-12-74	D	D	0	17.0													0	0
6-12-74	D	D	2	15.0	2100			68									2168	0
6-12-74	D	D	4	17.0	1250												1250	0
6-12-74	D	D	6	15.0	840			56									896	0
6-12-74	D	D	8	15.0	949												949	219
6-12-74	N	D	0	14.1	2597			611									3208	6269
6-12-74	N	D	2	14.1	4718			421									5139	858
6-12-74	N	D	4	14.1	3877	67		135									4079	352
6-12-74	N	D	6	14.1	5609												5609	1683
6-12-74	N	D	8	14.2	4636												4636	927

Appendix 7. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
6-12-74	D	E	0	15.5													0	0
6-12-74	D	E	8	15.5													0	0
6-12-74	D	E	14	12.8	100												100	0
6-12-74	D	E	20	12.8	37												37	0
6-11-74	D	G	0	15.3	581			125									706	0
6-11-74	D	G	2	15.0	1644			42									1686	0
6-11-74	D	G	4	15.3	1719			52									1771	0
6-11-74	D	G	6	15.0	1051			39									1090	0
6-11-74	N	G	0	14.0	5120			386									5506	0
6-11-74	N	G	2	14.5	1053	54											1107	333
6-11-74	N	G	4	14.5	946												946	0
6-11-74	N	G	6	14.5	2881												2881	67
6-11-74	D	H	0	14.5				77									77	0
6-11-74	D	H	2	14.5	473			156									629	237
6-11-74	D	H	4	14.5	1008												1008	0
6-11-74	D	H	6	14.5	3094			38									3132	80
6-11-74	D	H	8	15.0	1618												1618	0
6-11-74	N	H	0	13.8	1251			135									1386	33
6-11-74	N	H	2	14.3	3838			112									3950	114
6-11-74	N	H	4	14.3	4053												4053	0
6-11-74	N	H	6	14.3	3253			89									3342	0
6-11-74	N	H	8	14.3	3555												3555	0
7-09-74	D	C	0	25.0	290												290	0
7-09-74	D	C	2	25.0	1011												1011	0
7-09-74	D	C	4	19.9	1204												1204	0
7-09-74	D	C	6	19.9	989												989	0
7-09-74	N	C	0	21.8	597												597	1601
7-09-74	N	C	2	21.8	3550												3550	0
7-09-74	N	C	4	15.0	10782			277									11059	326
7-09-74	N	C	6	15.0	4984	1694											6678	14512
7-09-74	D	D	0	23.6	84												84	0
7-09-74	D	D	2	23.6	2535												2535	0
7-09-74	D	D	4	23.6	722												722	0
7-09-74	D	D	6	11.3	595												595	0
7-09-74	D	D	8	11.3	2685												2685	537
7-09-74	N	D	0	21.2	751			107									858	0
7-09-74	N	D	2	21.2	2949	165											3114	347
7-09-74	N	D	4	10.2	3636	438											4074	0
7-09-74	N	D	6	10.2		1606											1606	2000
7-08-74	N	D	8	10.2	274												274	0

Appendix 7. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
7-07-74	D	E	0	22.0													0	0
7-09-74	D	E	8	22.0	232												232	0
7-09-74	D	E	14	8.2	105												105	0
7-09-74	D	E	20	8.2													0	0
7-08-74	D	G	0	24.4	10166												10166	0
7-08-74	D	G	2	24.4	390												390	0
7-08-74	D	G	4	17.6	1403												1403	0
7-08-74	D	G	6	17.6	3030												3030	0
7-08-74	N	G	0	21.5	8310												8310	0
7-08-74	N	G	2	21.5	5338												5338	0
7-08-74	N	G	4	11.3	6213												6213	0
7-08-74	N	G	6	11.3	360	272											632	0
7-08-74	D	H	0	23.7	2244												2244	0
7-08-74	D	H	2	23.7	2752												2752	0
7-08-74	D	H	4	23.7	157												157	0
7-08-74	D	H	6	14.8	246												246	0
7-08-74	D	H	8	14.8	1103												1103	0
7-08-74	N	H	0	24.0	3072												3072	0
7-08-74	N	H	2	24.0	1155												1155	0
7-08-74	N	H	4	10.5	745												745	0
7-08-74	N	H	6	24.0	884												884	0
7-08-74	N	H	8	10.5	678												678	0
8-20-74	D	C	0	24.0													0	0
8-20-74	D	C	2	24.0	281												281	0
8-20-74	D	C	4	24.0	114												114	0
8-20-74	D	C	6	22.5	180												180	45
8-20-74	N	C	0	20.5	400												400	0
8-20-74	N	C	2	20.5	598												598	0
8-20-74	N	C	4	19.5	770												770	0
8-20-74	N	C	6	19.5	656												656	0
8-20-74	D	D	0	23.4	73												73	0
8-20-74	D	D	2	23.4													0	0
8-20-74	D	D	4	23.4	76												76	0
8-19-74	D	D	6	20.0	39												39	0
8-20-74	D	D	8	20.0	31												31	0
8-19-74	N	D	0	21.8	168												168	0
8-19-74	N	D	2	21.8	1618												1618	0
8-19-74	N	D	4	21.8	128												128	0
8-19-74	N	D	6	16.4													0	0
8-19-74	N	D	8	16.4	163												163	0

Appendix 7. Continued.

Sample Parameters					Species/Groups														
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
8-20-74	D	E	0	24.0													0	0
8-20-74	D	E	8	24.0													0	0
8-20-74	D	E	14	8.0													0	0
8-20-74	D	E	20	8.0													0	0
8-19-74	D	G	0	22.2	323	46											369	0
8-19-74	D	G	2	22.2	58												58	174
8-19-74	D	G	4	17.9													0	72
8-19-74	D	G	6	22.2	61												61	183
8-19-74	N	G	0	21.5	493												493	0
8-19-74	N	G	4	18.1	220												220	0
8-19-74	N	G	6	18.1	57												57	0
8-19-74	D	H	2	21.4	766												766	0
8-19-74	D	H	4	21.4	48												48	0
8-19-74	D	H	6	21.4	52												52	0
8-19-74	D	H	8	14.5	95												95	0
8-19-74	N	H	0	22.4	440												440	0
8-19-74	N	H	2	22.4	171												171	0
8-19-74	N	H	4	22.4													0	0
8-19-74	N	H	6	22.4	69												69	0
9-10-74	D	C	0	19.7	117												117	0
9-10-74	D	C	2	19.7													0	0
9-10-74	D	C	4	19.7													0	0
9-10-74	D	C	6	19.0													0	0
9-10-74	N	C	0	19.0	42												42	0
9-10-74	N	C	2	19.0	294												294	0
9-10-74	N	C	4	19.0	176												176	0
9-09-74	N	C	6	17.5	36												36	0
9-10-74	D	D	0	19.5	68												68	0
9-10-74	D	D	2	19.5													0	0
9-10-74	D	D	4	19.5													0	0
9-10-74	D	D	6	19.5													0	0
9-10-74	D	D	8	18.0	32												32	0
9-09-74	N	D	0	19.2	72												72	0
9-09-74	N	D	2	19.2	192												192	0
9-09-74	N	D	4	19.2	48												48	0
9-09-74	N	D	6	19.2	43												43	0
9-09-74	N	D	8	17.2	156												156	0

Appendix 7. Continued.

Sample Parameters					Species/Groups													
Date	DI	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
9-10-74	D	E	0	19.5	35												35	0
9-10-74	D	E	8	19.5													0	0
9-10-74	D	E	14	10.0													0	0
9-10-74	D	E	20	10.0													0	0
9-09-74	D	G	0	19.2	42												42	0
9-09-74	D	G	2	19.2													0	0
9-09-74	D	G	4	19.2													0	0
9-09-74	D	G	6	17.6													0	0
9-09-74	N	G	0	19.5	170												170	0
9-09-74	N	G	2	19.5	506												506	0
9-09-74	N	G	4	19.5													0	0
9-09-74	N	G	6	17.5													0	0
9-09-74	D	H	0	19.5	77												77	0
9-09-74	D	H	2	19.5													0	0
9-09-74	D	H	4	19.5	36												36	0
9-09-74	D	H	6	19.5													0	0
9-09-74	D	H	8	17.5													0	0
9-09-74	N	H	0	19.0	80												80	0
9-09-74	N	H	2	19.0													0	0
9-09-74	N	H	4	19.0	39												39	0
9-09-74	N	H	6	19.0													0	0
9-09-74	N	H	8	16.8													0	0
10-08-74	D	C	0	13.5													0	0
10-08-74	D	C	2	13.5													0	0
10-08-74	D	C	4	13.5													0	0
10-08-74	D	C	6	13.0													0	0
10-08-74	N	C	0	14.0													0	0
10-08-74	N	C	2	14.0													0	0
10-08-74	N	C	4	14.0													0	0
10-08-74	N	C	6	13.5													0	0
10-08-74	D	D	0	14.0													0	0
10-08-74	D	D	2	14.0													0	0
10-08-74	D	D	4	14.0													0	0
10-08-74	D	D	6	14.0													0	0
10-08-74	D	D	8	13.5													0	0
10-08-74	N	D	0	14.0													0	0
10-08-74	N	D	2	14.0													0	0
10-08-74	N	D	4	14.0													0	0
10-08-74	N	D	6	14.0													0	0
10-08-74	N	D	8	13.5													0	0

Appendix 7. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
10-08-74	D	G	0	13.5													0	0
10-08-74	D	G	2	13.5													0	0
10-08-74	D	G	4	13.5													0	0
10-08-74	D	G	6	13.0													0	0
10-07-74	N	G	0	13.0													0	0
10-07-74	N	G	2	13.0													0	0
10-07-74	N	G	4	13.0													0	0
10-07-74	N	G	6	13.0													0	0
10-08-74	D	H	0	13.0													0	0
10-08-74	D	H	2	13.0													0	0
10-08-74	D	H	4	13.0													0	0
10-08-74	D	H	6	13.0													0	0
10-08-74	D	H	8	13.0													0	0
10-07-74	N	H	0	13.0	33												33	0
10-07-74	N	H	2	13.0													0	0
10-07-74	N	H	4	13.0													0	40
10-07-74	N	H	6	13.0													0	0
10-07-74	N	H	8	13.5	60												60	0
11-11-74	N	C	0	10.1													0	0
11-11-74	N	C	2	10.1													0	0
11-10-74	N	C	4	10.1													0	0
11-10-74	N	C	6	9.9													0	0
11-10-74	N	D	0	10.5													0	0
11-10-74	N	D	2	10.5													0	0
11-10-74	N	D	4	10.5													0	0
11-10-74	N	D	6	10.5													0	0
11-10-74	N	D	8	10.1													0	0
11-10-74	N	G	0	9.9													0	0
11-10-74	N	G	2	9.9													0	0
11-10-74	N	G	4	9.9													0	0
11-10-74	N	G	6	10.1													0	0

Appendix 7. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
11-10-74	N	H	0	10.5													0	0
11-10-74	N	H	2	10.5													0	0
11-10-74	N	H	4	10.5													0	0
11-10-74	N	H	6	10.5													0	0
11-10-74	N	H	8	10.5													0	0

Appendix 8. Densities (no./1,000 m^3) for fish eggs and larvae collected at beach (A, B, F) and open water (C, D, G, H, E, W, R) stations in Cook Plant study areas, southeastern Lake Michigan, 1975.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
4-15-75	D	A	0	8.3													0	0
4-15-75	D	A	0	8.3													0	0
4-15-75	N	A	0	6.5													0	0
4-15-75	N	A	0	6.5													0	0
4-15-75	D	B	0	7.5													0	0
4-15-75	D	B	0	7.5													0	0
4-15-75	N	B	0	5.7													0	0
4-15-75	N	B	0	5.7													0	0
4-15-75	D	F	0	8.1													0	0
4-15-75	D	F	0	8.1													0	0
4-15-75	N	F	0	6.5													0	0
4-15-75	N	F	0	6.5													0	0
5-13-75	D	A	0	12.9			1790										1790	0
5-13-75	D	A	0	12.9			2890										2890	0
5-14-75	N	A	0	10.0			652										652	0
5-14-75	N	A	0	10.0			1306										1306	0
5-13-75	D	B	0	12.0			460										460	0
5-13-75	D	B	0	12.0			345										345	0
5-14-75	N	B	0	9.5			208										208	940
5-14-75	N	B	0	9.5			417										417	835
5-13-75	D	F	0	11.8			560										560	0
5-14-75	D	F	0	11.8			1569										1569	1234
5-14-75	N	F	0	10.1			117										117	0
5-14-75	N	F	0	10.1			1170										1170	0
6-10-75	D	A	0	16.0													0	0
6-24-75	D	A	0	24.0	1666												1666	128
6-10-75	D	A	0	16.0	138												138	0
6-24-75	D	A	0	24.0	1004												1004	0
6-23-75	N	A	0	22.5	4998	1776											6774	4222
6-23-75	N	A	0	22.5	4443	1221											5664	46666

Appendix 8. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
6-24-75	D	B	0	24.0	969												969	0
6-10-75	D	B	0	16.5	142												142	0
6-24-75	D	B	0	24.0	870												870	124
6-10-75	D	B	0	16.5	450												450	0
6-23-75	N	B	0	22.6	4311	1336											5647	297
6-23-75	N	B	0	22.6	5867	297											6164	14129
6-10-75	D	F	0	13.8	122												122	0
6-24-75	D	F	0	23.3	1395	155											1550	155
6-10-75	D	F	0	13.8	527												527	0
6-24-75	D	F	0	23.3	1114												1114	0
6-23-75	N	F	0	22.9	1715	2975											4690	0
6-23-75	N	F	0	22.9	1950	1561											3511	1953
7-16-75	D	A	0	26.4													0	0
7-16-75	D	A	0	26.4	92												92	0
7-16-75	N	A	0	24.6	8270	1196					1307						10773	0
7-16-75	N	A	0	24.6	8708						2505						11213	0
7-16-75	D	B	0	27.7	297												297	99
7-16-75	D	B	0	27.7													0	0
7-17-75	N	B	0	24.5	1653	2012											3665	4736
7-17-75	N	B	0	24.5	490	1768					196						2454	0
7-16-75	D	F	0	26.7	1038												1038	0
7-16-75	D	F	0	26.7	1290												1290	0
7-16-75	N	F	0	24.4	1223	2363											3586	87
7-16-75	N	F	0	24.4	2589	1995											4584	0
8-11-75	D	A	0	22.9													0	0
8-11-75	D	A	0	22.9													0	0
8-12-75	N	A	0	23.3		202											202	0
8-12-75	N	A	0	23.3	348	232											580	0
8-11-75	D	B	0	23.5	4011												4011	0
8-11-75	D	B	0	23.5	5439												5439	0
8-12-75	N	B	0	24.0	94	188											282	0
8-12-75	N	B	0	24.0	218	218											436	0

Appendix 8. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
8-11-75	D	F	0	23.5	6799												6799	0
8-11-75	D	F	0	23.5	2215												2215	0
8-13-75	N	F	0	23.0	628	157											785	0
8-13-75	N	F	0	23.0	292	292											584	0
9-09-75	D	A	0	20.5													0	0
9-09-75	D	A	0	20.5													0	0
9-10-75	N	A	0	18.9	123												123	0
9-10-75	N	A	0	18.9													0	0
9-09-75	D	B	0	21.0	460												460	0
9-09-75	D	B	0	21.0	111												111	0
9-10-75	N	B	0	18.9													0	0
9-10-75	N	B	0	18.9	123												123	0
9-09-75	D	F	0	19.8													0	0
9-09-75	D	F	0	19.8	148												148	0
9-09-75	N	F	0	18.9													0	0
9-09-75	N	F	0	18.9													0	0
10-14-75	D	A	0	17.8													0	0
10-14-75	D	A	0	17.8													0	0
10-13-75	N	A	0	16.5													0	0
10-13-75	N	A	0	16.5					116								116	0
10-14-75	D	B	0	18.7													0	0
10-14-75	D	B	0	18.7	1833												1833	0
10-13-75	N	B	0	16.3													0	0
10-13-75	N	B	0	16.3													0	0
10-14-75	D	F	0	16.2													0	0
10-14-75	D	F	0	16.2	194												194	0
10-13-75	N	F	0	17.5													0	0
10-13-75	N	F	0	17.5													0	0

Appendix 8. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
11-04-75	D	A	0	14.0													0	0
11-04-75	D	A	0	14.0													0	0
11-04-75	N	A	0	13.4													0	0
11-04-75	N	A	0	13.4													0	0
11-04-75	D	B	0	15.0													0	0
11-04-75	D	B	0	15.0													0	0
11-04-75	N	B	0	13.5													0	0
11-04-75	N	B	0	13.5													0	0
11-04-75	D	F	0	13.9													0	0
11-04-75	D	F	0	13.9													0	0
11-04-75	N	F	0	13.9													0	0
11-04-75	N	F	0	13.9													0	0
4-14-75	D	C	0	3.0													0	0
4-14-75	D	C	2	3.0													0	0
4-14-75	D	C	4	2.2								105					105	0
4-14-75	D	C	6	2.2													0	0
4-14-75	N	C	0	1.0													0	0
4-14-75	N	C	2	1.0													0	0
4-14-75	N	C	4	1.0													0	0
4-14-75	N	C	6	1.0													0	0
4-14-75	D	D	0	4.8													0	0
4-14-75	D	D	2	4.8													0	0
4-14-75	D	D	4	4.8													0	0
4-14-75	D	D	6	4.7													0	0
4-14-75	D	D	8	4.8													0	0
4-14-75	N	D	0	1.0													0	0
4-14-75	N	D	2	1.0													0	0
4-14-75	N	D	4	1.0													0	0
4-14-75	N	D	6	0.7													0	0
4-14-75	N	D	8	1.0													0	0

Appendix 8. Continued.

Sample Parameters					Species/Groups													
Date	DI	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
4-16-75	D	E	0	3.6													0	0
4-16-75	D	E	8	3.6													0	0
4-16-75	D	E	14	3.5								135					135	0
4-16-75	D	E	20	3.5													0	0
4-16-75	N	E	0	3.6													0	0
4-16-75	N	E	8	3.6													0	0
4-16-75	N	E	14	3.5													0	0
4-16-75	N	E	20	3.5													0	0
4-14-75	D	G	0	1.9													0	0
4-14-75	D	G	2	1.9													0	0
4-14-75	D	G	4	1.7													0	0
4-14-75	D	G	6	1.7													0	0
4-14-75	N	G	0	1.1													0	0
4-14-75	N	G	2	1.1													0	0
4-14-75	N	G	4	1.1													0	0
4-14-75	N	G	6	1.1													0	0
4-14-75	D	H	0	1.6													0	0
4-14-75	D	H	2	1.6													0	0
4-14-75	D	H	4	1.6													0	0
4-14-75	D	H	6	1.0													0	0
4-14-75	D	H	8	1.0													0	0
4-14-75	N	H	0	0.5													0	0
4-14-75	N	H	2	0.5													0	0
4-14-75	N	H	4	0.5													0	0
4-14-75	N	H	6	0.1													0	0
4-14-75	N	H	8	0.1													0	0
4-14-75	D	R	0	4.6													0	0
4-14-75	D	R	2	4.6													0	0
4-14-75	D	R	4	3.9													0	0
4-14-75	D	R	6	3.9													0	0
4-14-75	N	R	0	1.4													0	0
4-14-75	N	R	2	1.4													0	0
4-14-75	N	R	4	1.6													0	0
4-14-75	N	R	6	1.6													0	0

Appendix 8. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
4-16-75	D	W	0	3.7													0	0
4-16-75	D	W	8	3.7													0	0
4-16-75	D	W	14	3.5													0	0
4-16-75	D	W	20	3.5													0	0
4-14-75	N	W	0	3.7													0	0
4-16-75	N	W	8	3.7													0	0
4-16-75	N	W	14	3.5													0	0
4-16-75	N	W	20	3.5													0	0
5-14-75	D	C	0	10.0													0	0
5-14-75	D	C	2	10.0													0	0
5-14-75	D	C	4	9.0			219										219	0
5-14-75	D	C	6	9.0			573										573	0
5-15-75	N	C	0	8.2													0	0
5-15-75	N	C	2	8.2													0	0
5-15-75	N	C	4	8.2													0	0
5-14-75	N	C	6	8.2													0	0
5-14-75	D	D	0	10.0													0	0
5-14-75	D	D	2	10.0													0	0
5-14-75	D	D	4	10.0													0	0
5-14-75	D	D	6	8.5													0	0
5-14-75	D	D	8	8.5													0	0
5-15-75	N	D	0	9.9													0	0
5-15-75	N	D	2	9.9													0	0
5-15-75	N	D	4	9.9			122										122	0
5-15-75	N	D	6	9.9													0	0
5-15-75	N	D	8	9.9													0	0
5-14-75	D	E	0	10.2													0	0
5-14-75	D	E	8	10.2													0	0
5-14-75	D	E	14	5.9													0	0
5-14-75	D	E	20	5.9													0	0
5-15-75	N	E	0	10.1													0	0
5-15-75	N	E	8	10.1													0	0
5-15-75	N	E	14	7.0													0	0
5-15-75	N	E	20	7.0													0	0

Appendix 8. Continued.

Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
5-14-75	D	G	0	9.5													0	0
5-14-75	D	G	2	9.5			62										62	0
5-14-75	D	G	4	8.2			65										65	0
5-14-75	D	G	6	8.2													0	0
5-14-75	N	G	0	9.6													0	0
5-14-75	N	G	2	9.6													0	0
5-14-75	N	G	4	8.6													0	0
5-14-75	N	G	6	8.6													0	0
5-14-75	D	H	0	9.8													0	0
5-14-75	D	H	2	9.8			54										54	0
5-14-75	D	H	4	8.0			57										57	0
5-14-75	D	H	6	8.0													0	0
5-14-75	D	H	8	8.0													0	0
5-14-75	N	H	0	8.8													0	0
5-14-75	N	H	2	8.8													0	0
5-14-75	N	H	4	8.8													0	0
5-14-75	N	H	6	7.8													0	0
5-14-75	N	H	8	7.8													0	0
5-14-75	D	R	0	8.8			208										208	0
5-14-75	D	R	2	8.8			126										126	0
5-14-75	D	R	4	8.0													0	0
5-14-75	D	R	6	8.0			424										424	0
5-15-75	N	R	0	10.2			189										189	0
5-15-75	N	R	2	10.2			594										594	99
5-15-75	N	R	4	7.6													0	0
5-15-75	N	R	6	7.6													0	0
5-13-75	D	W	0	11.5													0	0
5-13-75	D	W	8	11.5													0	0
5-13-75	D	W	14	5.0								55					55	0
5-13-75	D	W	20	5.0													0	0
5-13-75	N	W	0	7.3													0	0
5-13-75	N	W	8	7.3													0	0
5-13-75	N	W	14	4.6													0	0
5-13-75	N	W	20	4.6													0	0

Appendix 8. Continued.

Sample Parameters					Species/Groups													
Date	DI	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
6-10-75	D	C	0	17.0													0	0
6-10-75	D	C	2	16.0													0	0
6-10-75	D	C	4	15.7	54												54	0
6-10-75	D	C	6	9.2	310												310	0
6-10-75	N	C	0	15.4	100	33											133	0
6-10-75	N	C	2	14.9	177	44											221	0
6-10-75	N	C	4	8.6	572	44											616	88
6-10-75	N	C	6	8.5	150												150	0
6-10-75	D	D	0	16.2	82												82	0
6-10-75	D	D	2	16.1													0	0
6-10-75	D	D	4	15.2	42												42	0
6-10-75	D	D	6	11.0	201												201	0
6-10-75	D	D	8	8.7	742												742	0
6-10-75	N	D	0	14.4	595	37											632	0
6-10-75	N	D	2	14.4	500								41				541	586
6-10-75	N	D	4	13.5	488	40											528	2686
6-10-75	N	D	6	8.8	172	86											258	1561
6-10-75	N	D	8	8.5		112											112	224
6-11-75	D	E	0	16.7	160												160	0
6-11-75	D	E	8	16.5	46												46	0
6-11-75	D	E	14	16.3													0	0
6-11-75	D	E	20	8.3													0	0
6-25-75	N	E	0	19.0	33												33	67
6-25-75	N	E	8	18.7	70												70	142
6-25-75	N	E	14	13.0													0	885
6-25-75	N	E	20	8.0													0	1809
6-10-75	D	G	0	15.9	111												111	0
6-10-75	D	G	2	15.4	46												46	0
6-10-75	D	G	4	11.5	347												347	0
6-10-75	D	G	6	10.5	975												975	0
6-11-75	N	G	0	13.5	975												975	0
6-11-75	N	G	2	10.0	860												860	0
6-11-75	N	G	4	8.6	212												212	0
6-11-75	N	G	6	8.0	112												112	0

Appendix 8. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
6-10-75	D	H	0	16.2	916												916	0
6-10-75	D	H	2	16.2	373												373	0
6-10-75	D	H	4	13.1	526												526	0
6-10-75	D	H	6	9.3	247												247	0
6-10-75	D	H	8	9.2	144			45									189	96
6-11-75	N	H	0	14.5	570			76									646	912
6-11-75	N	H	2	11.3	384												384	128
6-11-75	N	H	4	8.5	541												541	41
6-11-75	N	H	6	7.9	41												41	125
6-11-75	N	H	8	7.9													0	610
6-10-75	D	R	0	17.7	135												135	0
6-10-75	D	R	2	16.4													0	100
6-10-75	D	R	4	15.8	118												118	237
6-10-75	D	R	6	14.8	42												42	423
6-10-75	N	R	0	16.8	206	124											330	0
6-10-75	N	R	2	16.5	169	253											422	932
6-10-75	N	R	4	14.6	226	45							44				315	407
6-10-75	N	R	6	12.0	60												60	0
6-10-75	D	W	0	17.2													0	0
6-10-75	D	W	8	16.1													0	0
6-10-75	D	W	14	15.0													0	0
6-10-75	D	W	20	8.5													0	0
6-11-75	N	W	0	17.0				27									27	0
6-11-75	N	W	8	16.8	91												91	91
6-11-75	N	W	14	14.5	60												60	303
6-11-75	N	W	20	8.3	32												32	0
7-15-75	D	C	0	23.9	409												409	0
7-15-75	D	C	2	23.7	11159												11159	0
7-15-75	D	C	4	23.7	6994												6994	0
7-15-75	D	C	6	23.7	2776												2776	0
7-16-75	N	C	0	22.8	1850	28					28						1906	7744
7-16-75	N	C	2	22.8	2268												2268	13304
7-16-75	N	C	4	22.5	3970	156											4126	8203
7-16-75	N	C	6	22.2	3544	235											3779	17541

Appendix 8. Continued.

Sample Parameters					Species/Groups													
Date	DI	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
7-15-75	D	D	0	23.7	28												28	0
7-31-75	D	D	0	24.5													0	0
7-15-75	D	D	2	23.3	1876												1876	0
7-31-75	D	D	2	24.0	30												30	0
7-15-75	D	D	4	23.2	372												372	0
7-31-75	D	D	4	15.0	87												87	0
7-31-75	D	D	6	10.0													0	0
7-15-75	D	D	6	23.2	756												756	0
7-31-75	D	D	8	10.0	29												29	0
7-15-75	D	D	8	23.2	221												221	0
7-15-75	N	D	0	22.7	5880												5880	28
7-15-75	N	D	2	22.7	3927												3927	53
7-15-75	N	D	4	22.5	1957	33		33									2023	34
7-15-75	N	D	6	22.0	1156												1156	1158
7-15-75	N	D	8	21.7	772												772	562
7-15-75	D	E	0	22.8													0	0
7-15-75	D	E	8	22.2	29												29	0
7-15-75	D	E	14	22.2	55												55	0
7-15-75	D	E	20	7.8													0	0
7-16-75	N	E	0	22.0	54												54	27
7-16-75	N	E	8	22.0	130												130	525
7-16-75	N	E	14	21.1													0	60
7-16-75	N	E	20	7.7													0	357
7-15-75	D	G	0	23.3	3489												3489	0
7-15-75	D	G	2	23.1	5739												5739	0
7-15-75	D	G	4	23.1	333												333	0
7-15-75	D	G	6	22.9	272												272	0
7-15-75	N	G	0	22.7	3525												3525	0
7-15-75	N	G	2	22.0	4578	73											4651	1922
7-15-75	N	G	4	21.9	3524	109											3633	0
7-15-75	N	G	6	21.9	1457												1457	0
7-15-75	D	H	0	23.6	1767												1767	0
7-15-75	D	H	2	22.9	1694												1694	0
7-15-75	D	H	4	22.9	652												652	0
7-15-75	D	H	6	22.5	339												339	0
7-15-75	D	H	8	22.5	444												444	0
7-15-75	N	H	0	22.8	2885	27											2912	0
7-15-75	N	H	2	22.4	1345												1345	0
7-15-75	N	H	4	22.1	1131												1131	0
7-15-75	N	H	6	21.9	532												532	0
7-15-75	N	H	8	21.6	661												661	0

Appendix 8. Continued.

Sample Parameters					Species/Groups													
Date	DI	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
7-15-75	D	R	0	23.4	156												156	0
7-15-75	D	R	2	23.2	2186												2186	0
7-15-75	D	R	4	23.2	1539												1539	0
7-15-75	D	R	6	23.2	1878												1878	83
7-16-75	N	R	0	22.5	2330	132					26						2488	11027
7-16-75	N	R	2	22.4	3270	157	31									XP: 63	3521	9437
7-16-75	N	R	4	22.4	2982	372											3354	9856
7-16-75	N	R	6	22.3	4266	330	66										4662	3970
7-15-75	D	W	0	23.2													0	0
7-15-75	D	W	8	22.0	29												29	0
7-15-75	D	W	14	22.0													0	0
7-15-75	D	W	20	7.8													0	0
7-15-75	N	W	0	22.3													0	0
7-15-75	N	W	8	21.5													0	0
7-15-75	N	W	14	21.3	29												29	0
7-15-75	N	W	20	8.2													0	0
8-12-75	D	C	0	24.4													0	0
8-12-75	D	C	2	23.5	351												351	0
8-12-75	D	C	4	23.0	88												88	0
8-12-75	D	C	6	23.0	29												29	0
8-12-75	N	C	0	23.5	1734												1734	0
8-12-75	N	C	2	23.5	763												763	0
8-12-75	N	C	4	22.0	500												500	0
8-12-75	N	C	6	21.5	425												425	0
8-12-75	D	D	0	23.4	55												55	0
8-12-75	D	D	2	23.2													0	0
8-12-75	D	D	4	23.0	25												25	0
8-12-75	D	D	6	20.7													0	0
8-12-75	D	D	8	20.5													0	0
8-12-75	N	D	0	23.3	439												439	0
8-12-75	N	D	2	23.3	936												936	0
8-13-75	N	D	4	23.3	304												304	0
8-13-75	N	D	6	22.5	253												253	0
8-13-75	N	D	8	17.7	72												72	0

Appendix 8. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
8-12-75	D	E	0	23.0	175												175	0
8-12-75	D	E	8	14.1													0	0
8-12-75	D	E	14	9.9													0	0
8-12-75	D	E	20	9.9													0	0
8-13-75	N	E	0	22.5	150												150	0
8-13-75	N	E	8	14.1	42												42	0
8-13-75	N	E	14	9.9	42												42	0
8-13-75	N	E	20	9.9	27												27	0
8-12-75	D	G	0	24.0	46												46	0
8-12-75	D	G	2	24.0	88												88	0
8-12-75	D	G	4	22.6													0	0
8-12-75	D	G	6	22.5													0	0
8-12-75	N	G	0	23.8	644												644	0
8-12-75	N	G	2	23.6	468												468	0
8-12-75	N	G	4	23.4	220												220	0
8-12-75	N	G	6	21.8	230												230	0
8-12-75	D	H	0	23.8	217												217	0
8-12-75	D	H	2	23.5													0	0
8-12-75	D	H	4	23.0													0	0
8-12-75	D	H	6	21.3													0	0
8-12-75	D	H	8	20.5													0	0
8-12-75	N	H	0	23.8	207												207	0
8-12-75	N	H	2	23.7	161												161	0
8-12-75	N	H	4	22.9	140												140	0
8-12-75	N	H	6	22.4	84												84	0
8-12-75	N	H	8	21.0	21												21	0
8-12-75	D	R	0	25.1	58												58	0
8-12-75	D	R	2	24.6	32												32	0
8-12-75	D	R	4	23.5													0	0
8-12-75	D	R	6	23.0													0	0
8-13-75	N	R	0	24.2	302												302	0
8-13-75	N	R	2	23.8	659												659	0
8-13-75	N	R	4	22.3	414												414	0
8-13-75	N	R	6	21.8	529												529	0

Appendix 8. Continued.

Sample Parameters					Species/Groups														
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
8-12-75	D	W	0	24.0													0	0
8-12-75	D	W	8	23.2													0	0
8-12-75	D	W	14	9.2													0	0
8-12-75	D	W	20	9.2													0	0
8-12-75	N	W	0	24.0	62												62	0
8-12-75	N	W	8	23.2	28												28	0
8-12-75	N	W	14	9.2													0	0
8-12-75	N	W	20	9.2													0	0
9-10-75	D	C	0	21.0													0	0
9-09-75	D	C	2	19.0													0	0
9-09-75	D	C	4	19.0													0	0
9-09-75	D	C	6	19.0													0	0
9-11-75	N	C	0	19.2	21												21	0
9-11-75	N	C	2	19.0	90												90	0
9-11-75	N	C	4	19.0	71												71	0
9-11-75	N	C	6	18.4	100												100	0
9-10-75	D	D	0	20.0													0	0
9-10-75	D	D	2	19.5													0	0
9-10-75	D	D	4	19.5													0	0
9-10-75	D	D	6	19.5													0	0
9-10-75	D	D	8	18.5													0	0
9-11-75	N	D	0	19.2	34												34	0
9-11-75	N	D	2	19.2	91												91	0
9-11-75	N	D	4	19.2													0	0
9-11-75	N	D	6	19.2													0	0
9-10-75	N	D	8	19.0													0	0
9-10-75	D	E	0	19.8													0	0
9-10-75	D	E	8	18.8													0	0
9-10-75	D	E	14	18.8													0	0
9-10-75	D	E	20	18.8													0	0
9-10-75	N	E	0	18.8													0	0
9-10-75	N	E	8	18.4	32												32	0
9-10-75	N	E	14	18.4													0	0
9-10-75	N	E	20	18.4													0	0

Appendix 8. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
9-10-75	D	G	0	19.9													0	0
9-10-75	D	G	2	19.6													0	0
9-10-75	D	G	4	19.3													0	0
9-10-75	D	G	6	19.3													0	0
9-10-75	N	G	0	19.8													0	0
9-10-75	N	G	2	19.5													0	0
9-10-75	N	G	4	19.0	30												30	0
9-10-75	N	G	6	19.0	104												104	0
9-10-75	D	H	0	20.0													0	0
9-10-75	D	H	2	19.6													0	0
9-10-75	D	H	4	19.0													0	0
9-10-75	D	H	6	19.0													0	0
9-10-75	D	H	8	19.0													0	0
9-10-75	N	H	0	19.5													0	0
9-10-75	N	H	2	19.5	31												31	0
9-10-75	N	H	4	19.5													0	0
9-10-75	N	H	6	18.9													0	0
9-10-75	N	H	8	18.9													0	0
9-10-75	D	R	0	19.8													0	0
9-10-75	D	R	2	19.0	36												36	0
9-10-75	D	R	4	19.0													0	0
9-10-75	D	R	6	19.0													0	0
9-11-75	N	R	0	19.8													0	0
9-11-75	N	R	2	19.5	66												66	0
9-11-75	N	R	4	19.2	54												54	0
9-11-75	N	R	6	19.2	68												68	0
9-10-75	D	W	0	19.2													0	0
9-10-75	D	W	8	18.6													0	0
9-10-75	D	W	14	18.9													0	0
9-10-75	D	W	20	13.1													0	0
9-10-75	N	W	0	19.0													0	0
9-10-75	N	W	8	18.8													0	0
9-10-75	N	W	14	18.8													0	0
9-10-75	N	W	20	18.8													0	0

Appendix 8. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
10-14-75	D	C	0	15.9													0	0
10-14-75	D	C	2	15.9													0	0
10-14-75	D	C	4	15.9													0	0
10-14-75	D	C	6	15.9													0	0
10-16-75	N	C	0	15.0													0	0
10-16-75	N	C	2	15.0													0	0
10-16-75	N	C	4	14.7					33								33	0
10-16-75	N	C	6	14.7													0	0
10-14-75	D	D	0	15.4													0	0
10-14-75	D	D	2	15.4													0	0
10-14-75	D	D	4	15.4													0	0
10-14-75	D	D	6	15.7													0	0
10-14-75	D	D	8	15.7													0	0
10-16-75	N	D	0	14.8													0	0
10-16-75	N	D	2	14.8													0	0
10-16-75	N	D	4	14.8													0	0
10-16-75	N	D	6	14.8													0	0
10-16-75	N	D	8	14.8													0	0
10-16-75	D	E	0	14.3													0	0
10-16-75	D	E	8	14.2													0	0
10-16-75	D	E	14	14.2													0	0
10-16-75	D	E	20	14.2													0	0
10-16-75	D	G	0	15.1													0	0
10-16-75	D	G	2	15.1													0	0
10-16-75	D	G	4	15.1													0	0
10-16-75	D	G	6	15.1													0	0
10-17-75	N	G	0	14.7													0	0
10-17-75	N	G	2	14.7													0	0
10-17-75	N	G	4	14.5	42												42	0
10-17-75	N	G	6	14.5													0	0
10-16-75	D	H	0	15.4													0	0
10-16-75	D	H	2	15.4													0	0
10-16-75	D	H	4	15.3													0	0
10-16-75	D	H	6	15.3													0	0
10-16-75	D	H	8	15.3													0	0
10-17-75	N	H	0	14.8													0	0
10-17-75	N	H	2	14.8													0	0
10-17-75	N	H	4	14.8													0	0
10-17-75	N	H	6	14.8													0	0
10-17-75	N	H	8	14.8													0	0

Appendix 8. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
10-14-75	D	R	0	15.8													0	0
10-14-75	D	R	2	15.8													0	0
10-14-75	D	R	4	15.6													0	0
10-14-75	D	R	6	15.6													0	0
10-16-75	N	R	0	15.0													0	0
10-16-75	N	R	2	15.0													0	0
10-16-75	N	R	4	14.7													0	0
10-16-75	N	R	6	14.7													0	0
10-16-75	D	W	0	14.3													0	0
10-16-75	D	W	8	14.4													0	0
10-16-75	D	W	14	14.4													0	0
10-16-75	D	W	20	14.3													0	0
10-17-75	N	W	0	14.0													0	0
10-17-75	N	W	8	14.0													0	0
10-17-75	N	W	14	14.0													0	0
10-17-75	N	W	20	14.0													0	0
11-06-75	D	C	0	13.2													0	0
11-06-75	D	C	2	13.2													0	0
11-06-75	D	C	4	12.4													0	0
11-06-75	D	C	6	12.4													0	0
11-05-75	N	C	0	12.9													0	0
11-05-75	N	C	2	12.2													0	0
11-05-75	N	C	4	12.2													0	0
11-05-75	N	C	6	11.6													0	0
11-06-75	D	D	0	13.0													0	0
11-06-75	D	D	2	13.0													0	0
11-06-75	D	D	4	13.0													0	0
11-06-75	D	D	6	12.4													0	0
11-06-75	D	D	8	12.4													0	0
11-05-75	N	D	0	13.2													0	0
11-05-75	N	D	2	12.3													0	0
11-05-75	N	D	4	12.2													0	0
11-05-75	N	D	6	11.9													0	0
11-05-75	N	D	8	11.9													0	0

Appendix 8. Continued.

Sample Parameters					Species/Groups														
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
11-06-75	D	E	0	13.8													0	0
11-06-75	D	E	8	13.8													0	0
11-06-75	D	E	14	11.0													0	0
11-06-75	D	E	20	11.0													0	0
11-05-75	N	E	0	11.8													0	0
11-06-75	N	E	8	11.2													0	0
11-06-75	N	E	14	11.2													0	0
11-06-75	N	E	20	11.2													0	0
11-06-75	D	G	0	12.8													0	0
11-06-75	D	G	2	12.8													0	0
11-06-75	D	G	4	12.2													0	0
11-06-75	D	G	6	12.2													0	0
11-05-75	N	G	0	13.4													0	0
11-05-75	N	G	2	12.1													0	0
11-05-75	N	G	4	12.2													0	0
11-05-75	N	G	6	12.4													0	0
11-06-75	D	H	0	12.9													0	0
11-06-75	D	H	2	12.9													0	0
11-06-75	D	H	4	12.3													0	0
11-06-75	D	H	6	12.3													0	0
11-06-75	D	H	8	12.3													0	0
11-05-75	N	H	0	12.9													0	0
11-05-75	N	H	2	12.3													0	0
11-05-75	N	H	4	12.2													0	0
11-05-75	N	H	6	12.2													0	0
11-05-75	N	H	8	12.2													0	0
11-06-75	D	R	0	13.0													0	0
11-06-75	D	R	2	13.0													0	0
11-06-75	D	R	4	12.8													0	0
11-06-75	D	R	6	12.8													0	0
11-05-75	N	R	0	12.9													0	0
11-05-75	N	R	2	12.8													0	0
11-05-75	N	R	4	12.2													0	0
11-05-75	N	R	6	12.1													0	0

Appendix 8. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
11-06-75	D	W	0	12.1													0	0
11-06-75	D	W	8	11.5													0	0
11-06-75	D	W	14	11.5													0	0
11-06-75	D	W	20	11.5													0	0

Appendix 9. Densities (no./1,000 m^3) for fish eggs and larvae collected at beach (A, B, F) and open water (C, D, G, H, E, W, R, N, 4, 5, 6) stations in Cook Plant study areas, southeastern Lake Michigan, 1976.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
2-26-76	D	A	0	7.5													0	0
2-26-76	D	A	0	7.5													0	0
2-26-76	N	A	0	4.7													0	0
2-26-76	N	A	0	4.7													0	0
2-26-76	D	B	0	6.2													0	0
2-26-76	D	B	0	6.2													0	0
2-26-76	N	B	0	5.9													0	0
2-26-76	N	B	0	5.9													0	0
4-12-76	D	A	0	10.1													0	0
4-12-76	D	A	0	10.1													0	0
4-13-76	N	A	0	7.9													0	0
4-13-76	N	A	0	7.9													0	0
4-12-76	D	B	0	9.5													0	0
4-12-76	D	B	0	9.5													0	0
4-13-76	N	B	0	7.0													0	0
4-13-76	N	B	0	7.0													0	0
4-12-76	D	F	0	10.3													0	0
4-12-76	D	F	0	10.3													0	0
4-13-76	N	F	0	7.9													0	0
4-13-76	N	F	0	7.9													0	0
5-10-76	D	A	0	17.5													0	0
5-10-76	D	A	0	17.5													0	0
5-10-76	N	A	0	15.5													0	0
5-10-76	N	A	0	15.5													0	0
5-10-76	D	B	0	15.5													0	0
5-10-76	D	B	0	15.5													0	0
5-10-76	N	B	0	15.0													0	0
5-10-76	N	B	0	15.0													0	0

Appendix 9. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
5-10-76	D	F	O	17.5													0	0
5-10-76	D	F	O	17.5													0	0
5-10-76	N	F	O	15.5													0	0
5-10-76	N	F	O	15.5													0	185
6-14-76	D	A	O	24.5	7494												7494	0
6-14-76	D	A	O	24.5	15590												15590	0
6-14-76	N	A	O	21.5	16874	14343					11814						43031	29535
6-14-76	N	A	O	21.5	3667	5808			305		4281						14061	39143
6-14-76	D	B	O	24.0	8660												8660	0
6-14-76	D	B	O	24.0	8504		125										8629	0
6-14-76	N	B	O	21.5	765	573											1338	4406
6-14-76	N	B	O	21.5	1200	1800											3000	6846
6-14-76	D	F	O	23.0	888												888	0
6-14-76	D	F	O	23.0	7716												7716	701
6-14-76	N	F	O	21.3	1856	2321											4177	0
6-14-76	N	F	O	21.3	2525	505											3030	0
7-13-76	D	A	O	20.3	408	205											613	308
7-13-76	D	A	O	20.3	404	101											505	303
7-13-76	N	A	O	18.0	832	624											1456	2708
7-13-76	N	A	O	18.0	870	435											1305	2614
7-13-76	D	B	O	20.5	351												351	234
7-13-76	D	B	O	20.5													0	0
7-13-76	N	B	O	19.0	871	290											1161	0
7-13-76	N	B	O	19.0	1113	478					159						1750	0
7-13-76	D	F	O	22.0	2768	138											2906	138
7-13-76	D	F	O	22.0	2664												2664	148
7-13-76	N	F	O	21.0	888	444											1332	0
7-13-76	N	F	O	21.0	750	428											1178	0

Appendix 9. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
8-09-76	D	A	0	24.5	642												642	0
8-09-76	D	A	0	24.5	240												240	0
8-10-76	N	A	0	23.0	642	107			107								856	322
8-10-76	N	A	0	23.0	240												240	0
8-09-76	D	B	0	24.3													0	238
8-09-76	D	B	0	24.3													0	0
8-10-76	N	B	0	22.0	357	357											714	0
8-10-76	N	B	0	22.0	119												119	0
8-09-76	D	F	0	24.0													0	0
8-09-76	D	F	0	24.0													0	0
8-10-76	N	F	0	22.0													0	0
8-10-76	N	F	0	22.0													0	0
9-13-76	D	A	0	22.0													0	0
9-13-76	D	A	0	22.0													0	0
9-14-76	N	A	0	20.0													0	0
9-14-76	N	A	0	20.0					99								99	0
9-13-76	D	B	0	22.0	303												303	0
9-13-76	D	B	0	22.0													0	0
9-14-76	N	B	0	19.9													0	0
9-14-76	N	B	0	19.9													0	0
9-13-76	D	F	0	21.7													0	0
9-13-76	D	F	0	21.7	121												121	0
9-14-76	N	F	0	19.5													0	0
9-14-76	N	F	0	19.5													0	0
10-11-76	D	A	0	16.3													0	0
10-11-76	D	A	0	16.3													0	0
10-12-76	N	A	0	13.9													0	0
10-12-76	N	A	0	13.9													0	0

Appendix 9. Continued.

Sample Parameters					Species/Groups													
Date	DI	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
10-11-76	D	B	0	15.5													0	0
10-11-76	D	B	0	15.5													0	0
10-12-76	N	B	0	13.5													0	0
10-12-76	N	B	0	13.5													0	0
10-11-76	D	F	0	15.0													0	0
10-11-76	D	F	0	15.0													0	0
10-11-76	N	F	0	14.0													0	0
10-11-76	N	F	0	14.0													0	0
11-08-76	D	A	0	6.0													0	0
11-08-76	D	A	0	6.0													0	0
11-08-76	N	A	0	5.0													0	0
11-08-76	N	A	0	5.0													0	0
11-08-76	D	B	0	6.5													0	0
11-08-76	D	B	0	6.5													0	0
11-08-76	N	B	0	5.0													0	0
11-08-76	N	B	0	5.0													0	0
11-08-76	D	F	0	5.5													0	0
11-08-76	D	F	0	5.5													0	0
11-08-76	N	F	0	5.5													0	0
11-08-76	N	F	0	5.5													0	0
4-14-76	D	C	0	9.5													0	0
4-14-76	D	C	2	9.0													0	0
4-14-76	D	C	4	8.6													0	0
4-14-76	D	C	6	8.2													0	0
4-14-76	N	C	0	8.5													0	0
4-14-76	N	C	2	8.5													0	0
4-14-76	N	C	4	8.5													0	0
4-14-76	N	C	6	8.5													0	0
4-14-76	D	D	0	12.4													0	0
4-14-76	D	D	2	8.7													0	0
4-14-76	D	D	4	8.4													0	0
4-14-76	D	D	6	7.7													0	0
4-14-76	D	D	8	7.7													0	0
4-14-76	N	D	0	7.8													0	0
4-14-76	N	D	2	7.6													0	0
4-14-76	N	D	4	7.6													0	0
4-14-76	N	D	6	7.5													0	0
4-14-76	N	D	8	7.4													0	0

Appendix 9. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
4-14-76	D	E	0	7.2													0	0
4-14-76	D	E	8	6.1													0	0
4-14-76	D	E	14	5.7													0	0
4-14-76	D	E	20	5.7								16					16	0
4-14-76	N	E	0	7.0													0	0
4-14-76	N	E	8	6.5													0	0
4-14-76	N	E	14	5.7													0	0
4-14-76	N	E	20	5.7													0	0
4-14-76	D	G	0	9.7													0	0
4-14-76	D	G	2	9.7													0	0
4-14-76	D	G	4	9.5													0	0
4-14-76	D	G	6	9.5													0	0
4-13-76	N	G	0	9.6													0	0
4-13-76	N	G	2	8.1													0	0
4-13-76	N	G	4	7.8													0	0
4-13-76	N	G	6	7.8													0	0
4-14-76	D	H	0	9.0													0	0
4-14-76	D	H	2	9.0													0	0
4-14-76	D	H	4	9.0													0	0
4-14-76	D	H	6	9.0													0	0
4-14-76	D	H	8	9.0													0	0
4-13-76	N	H	0	9.0													0	0
4-13-76	N	H	2	8.6													0	0
4-13-76	N	H	4	8.3													0	0
4-13-76	N	H	6	7.6													0	0
4-13-76	N	H	8	7.6													0	0
4-14-76	D	R	0	9.2													0	0
4-14-76	D	R	2	8.6													0	0
4-14-76	D	R	4	8.6													0	0
4-14-76	D	R	6	8.6													0	0
4-14-76	N	R	0	8.2													0	0
4-14-76	N	R	2	8.2													0	0
4-14-76	N	R	4	8.2													0	0
4-14-76	N	R	6	8.2													0	0

Appendix 9. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
4-14-76	D	W	0	8.5													0	0
4-14-76	D	W	8	6.9													0	0
4-14-76	D	W	14	5.7													0	0
4-14-76	D	W	20	5.7													0	0
4-13-76	N	W	0	7.3													0	0
4-13-76	N	W	8	6.5													0	0
4-13-76	N	W	14	5.7													0	0
4-13-76	N	W	20	5.7													0	0
5-12-76	D	C	0	13.1													0	0
5-12-76	D	C	2	12.4													0	0
5-12-76	D	C	4	12.3													0	0
5-12-76	D	C	6	11.5													0	0
5-14-76	N	C	0	12.2			33										33	0
5-14-76	N	C	2	12.0													0	0
5-14-76	N	C	4	12.0													0	0
5-14-76	N	C	6	11.6													0	0
5-12-76	D	D	0	12.5													0	0
5-12-76	D	D	2	11.7													0	0
5-12-76	D	D	4	11.2													0	0
5-12-76	D	D	6	11.0													0	0
5-12-76	D	D	8	10.8			28										28	0
5-13-76	N	D	0	12.0													0	0
5-13-76	N	D	2	11.8													0	0
5-13-76	N	D	4	11.8													0	0
5-14-76	N	D	6	11.8													0	0
5-14-76	N	D	8	10.5													0	0
5-12-76	D	E	0	12.3													0	0
5-12-76	D	E	8	10.7													0	0
5-12-76	D	E	14	10.7													0	0
5-12-76	D	E	20	9.7													0	0
5-13-76	N	E	0	10.2			25										25	0
5-13-76	N	E	8	10.0													0	0
5-13-76	N	E	14	10.0													0	0
5-13-76	N	E	20	10.0													0	0

Appendix 9. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
5-12-76	D	G	0	13.0													0	0
5-12-76	D	G	2	12.5													0	0
5-12-76	D	G	4	10.5													0	0
5-12-76	D	G	6	11.0													0	0
5-13-76	N	G	0	11.5													0	0
5-13-76	N	G	2	11.5													0	0
5-13-76	N	G	4	11.5													0	0
5-13-76	N	G	6	11.5													0	0
5-12-76	D	H	0	12.0													0	0
5-12-76	D	H	3	11.5			28										28	0
5-12-76	D	H	4	11.5													0	0
5-12-76	D	H	6	11.0			31										31	0
5-12-76	D	H	8	11.0													0	0
5-13-76	N	H	0	11.3													0	0
5-13-76	N	H	2	11.1													0	0
5-13-76	N	H	4	11.1													0	0
5-13-76	N	H	6	11.1													0	0
5-13-76	N	H	8	11.2													0	0
5-12-76	D	R	0	13.5													0	0
5-12-76	D	R	2	12.0													0	0
5-12-76	D	R	4	11.0													0	0
5-12-76	D	R	6	11.1													0	0
5-14-76	N	R	0	11.6			35										35	0
5-14-76	N	R	2	11.6													0	0
5-14-76	N	R	4	11.6													0	0
5-14-76	N	R	6	11.8													0	0
5-12-76	D	W	0	10.7													0	0
5-12-76	D	W	8	9.8													0	0
5-12-76	D	W	14	9.8			27										27	0
5-12-76	D	W	20	9.7													0	0
5-13-76	N	W	0	11.0													0	0
5-13-76	N	W	8	11.0													0	0
5-13-76	N	W	14	11.0													0	0
5-13-76	N	W	20	11.0													0	0

Appendix 9. Continued.

Sample Parameters					Species/Groups													
Date	DI	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
6-22-76	D	C	0	20.9	251												251	0
6-22-76	D	C	2	21.0	42												42	0
6-22-76	D	C	4	21.0	26												26	0
6-22-76	D	C	6	14.5	192												192	0
6-22-76	D	D	0	21.0	73												73	0
6-17-76	D	D	0	20.5	128												128	0
6-22-76	D	D	2	20.0	132												132	0
6-17-76	D	D	2	20.0	4537												4537	0
6-22-76	D	D	4	20.0	312												312	0
6-17-76	D	D	4	20.0	3061												3061	0
6-22-76	D	D	6	20.0	108												108	0
6-17-76	D	D	6	19.2	1594												1594	0
6-22-76	D	D	8	14.5	62												62	0
6-17-76	D	D	8	19.2	3140												3140	0
6-22-76	N	D	0	19.0	232												232	0
6-22-76	N	D	2	18.2	108												108	0
6-22-76	N	D	4	18.2	210												210	1326
6-22-76	N	D	6	9.9													0	0
6-22-76	D	E	0	20.0	111	22											133	0
6-22-76	D	E	8	20.0	56												56	0
6-22-76	D	E	14	20.0	29												29	0
6-22-76	D	E	20	17.0	32												32	0
6-22-76	N	E	0	17.5	52			26									78	0
6-22-76	N	E	8	15.8	25												25	0
6-22-76	N	E	14	15.8													0	0
6-22-76	N	E	20	14.4	48												48	0
6-21-76	D	G	0	19.5	650												650	0
6-21-76	D	G	2	18.7													0	0
6-21-76	D	G	4	18.7	27												27	0
6-21-76	D	G	6	18.7													0	0
6-21-76	N	G	0	18.5	170												170	0
6-21-76	N	G	2	18.2	72					18							90	0
6-21-76	N	G	4	18.2	54	26											80	1391
6-21-76	N	G	6	15.2	192												192	289

Appendix 9. Continued.

Sample Parameters					Species/Groups													
Date	DI	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
6-21-76	D	H	0	19.2	28												28	0
6-21-76	D	H	2	17.5													0	0
6-21-76	D	H	4	17.5													0	0
6-21-76	D	H	6	17.5	66												66	0
6-21-76	D	H	8	10.5	35												35	0
6-21-76	N	H	0	18.1	56												56	0
6-21-76	N	H	2	18.0	126												126	25
6-21-76	N	H	4	18.1	30					30							60	0
6-21-76	N	H	6	18.0				28									28	29
6-21-76	N	H	8	10.0													0	93
6-22-76	D	R	0	18.5	203												203	0
6-22-76	D	R	2	17.0													0	0
6-22-76	D	R	4	17.0	38												38	0
6-22-76	D	R	6	12.0	136												136	0
6-21-76	D	W	0	7.5	648												648	0
6-21-76	D	W	8	18.2	128												128	0
6-21-76	D	W	14	18.2	17												17	0
6-21-76	D	W	20	17.5													0	0
6-21-76	N	W	0	19.4	144			24									168	0
6-21-76	N	W	8	19.3	142												142	0
6-21-76	N	W	14	18.5													0	0
6-21-76	N	W	20	18.5												XX: 21	21	0
7-15-76	D	C	0	24.7	150												150	0
7-15-76	D	C	2	23.8	2638												2638	0
7-15-76	D	C	4	23.8	476												476	0
7-15-76	D	C	6	23.6	448												448	0
7-13-76	N	C	0	19.5	4265												4265	0
7-13-76	N	C	2	17.7	4830												4830	0
7-13-76	N	C	4	17.7	2039												2039	63
7-13-76	N	C	6	17.3	743			22									765	45
7-15-76	D	D	0	24.4													0	0
7-15-76	D	D	2	23.6	506												506	0
7-15-76	D	D	4	23.6	991												991	0
7-15-76	D	D	6	23.6	372												372	0
7-15-76	D	D	8	22.5	388												388	296
7-13-76	N	D	0	19.1	1111												1111	447
7-13-76	N	D	2	17.8	1916			23									1939	1226
7-13-76	N	D	4	17.8	388												388	41
7-13-76	N	D	6	17.8	402												402	64
7-13-76	N	D	8	17.3	531					21							552	0

Appendix 9. Continued.

Sample Parameters					Species/Groups													
Date	DI	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
7-15-76	D	E	0	21.1	364												364	0
7-15-76	D	E	8	20.2	39												39	0
7-15-76	D	E	14	20.2	20												20	0
7-15-76	D	E	20	8.7													0	0
7-17-76	N	E	0	21.6	56												56	0
7-17-76	N	E	8	21.0	125												125	25
7-17-76	N	E	14	20.2	25			24									49	0
7-17-76	N	E	20	20.2													0	0
7-15-76	D	G	0	25.1													0	0
7-15-76	D	G	2	24.1	305												305	0
7-15-76	D	G	4	24.1	1155												1155	0
7-15-76	D	G	6	23.5	1104												1104	0
7-14-76	N	G	0	21.0	669												669	325
7-14-76	N	G	2	21.3	1643												1643	0
7-14-76	N	G	4	21.3	2566												2566	19
7-17-76	N	G	6	22.4	4347												4347	0
7-15-76	D	H	0	23.1	326												326	0
7-15-76	D	H	2	22.8	1345												1345	0
7-15-76	D	H	4	22.8	760												760	0
7-15-76	D	H	6	22.8	657												657	0
7-15-76	D	H	8	21.9	219												219	0
7-17-76	N	H	0	22.3	3539												3539	0
7-17-76	N	H	2	22.3	4633											XX: 33	4666	0
7-17-76	N	H	4	22.3	5132												5132	0
7-17-76	N	H	6	22.3	5365												5365	0
7-17-76	N	H	8	22.3	6391												6391	0
7-30-76	D	N	0	25.0													0	0
7-30-76	D	N	2	24.0													0	0
7-30-76	D	N	2	24.0	69												69	0
7-15-76	D	R	0	23.6	78												78	0
7-15-76	D	R	2	23.6	2038												2038	28
7-15-76	D	R	4	23.6	1073												1073	0
7-15-76	D	R	6	22.4	818												818	37
7-14-76	N	R	0	18.8	897												897	75
7-14-76	N	R	2	18.8	597												597	16587
7-14-76	N	R	4	17.9	2583			28									2611	20127
7-14-76	N	R	6	17.1	1058												1058	19475

Appendix 9. Continued.

Sample Parameters					Species/Groups													
Date	DI	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
7-15-76	D	W	0	21.8	170												170	0
7-15-76	D	W	8	20.9													0	0
7-15-76	D	W	14	20.6	20												20	0
7-15-76	D	W	20	20.6													0	0
7-17-76	N	W	0	21.6	54												54	0
7-17-76	N	W	8	21.5	127												127	0
7-17-76	N	W	14	21.2	56												56	0
7-17-76	N	W	20	21.2	76												76	0
7-17-76	D	4	0	22.6	1995												1995	0
7-17-76	D	4	3	22.5	468												468	0
7-17-76	D	4	6	22.5	1555												1555	0
7-17-76	D	4	9	22.5	4174												4174	0
7-15-76	D	4	12	22.5	3158												3158	0
7-17-76	D	5	0	22.5	1634												1634	0
7-17-76	D	5	4	22.0	683												683	0
7-17-76	D	5	8	21.8	291												291	0
7-17-76	D	5	13	22.0	260												260	0
7-17-76	D	5	15	21.8	330												330	0
7-17-76	D	6	0	22.2	1674												1674	0
7-17-76	D	6	4	22.0	435												435	0
7-17-76	D	6	9	22.0													0	0
7-17-76	D	6	14	21.5	26												26	0
7-17-76	D	6	18	21.5	54												54	0
8-10-76	D	C	0	22.4													0	0
8-10-76	D	C	2	22.2	80												80	0
8-10-76	D	C	4	22.2													0	0
8-10-76	D	C	6	22.2	163												163	0
8-10-76	N	C	0	21.0	69												69	0
8-10-76	N	C	2	21.0	72												72	0
8-10-76	N	C	4	21.0	46												46	0
8-11-76	N	C	6	20.6	73												73	0

Appendix 9. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
8-10-76	D	D	0	22.5	62												62	0
8-10-76	D	D	2	22.5													0	0
8-10-76	D	D	4	22.2													0	0
8-10-76	D	D	6	22.2													0	0
8-10-76	D	D	8	22.2	31												31	0
8-11-76	N	D	0	21.5	560												560	0
8-11-76	N	D	2	21.5	396												396	0
8-11-76	N	D	4	21.5	132												132	0
8-11-76	N	D	6	21.5	154												154	0
8-11-76	N	D	8	21.4	126												126	0
8-10-76	D	E	0	21.5	56												56	0
8-10-76	D	E	8	20.8													0	0
8-10-76	D	E	14	15.4	33												33	0
8-10-76	D	E	20	15.4													0	0
8-10-76	N	E	0	21.5	116												116	0
8-10-76	N	E	8	20.8	32												32	0
8-10-76	N	E	14	15.4	155												155	0
8-10-76	N	E	20	15.4													0	0
8-10-76	D	G	0	22.2	72												72	0
8-10-76	D	G	2	21.5	696												696	0
8-10-76	D	G	4	21.4	161												161	0
8-10-76	D	G	6	21.2	266												266	0
8-10-76	N	G	0	21.6	97												97	0
8-10-76	N	G	2	21.5	25												25	0
8-10-76	N	G	4	21.5	169												169	0
8-10-76	N	G	6	21.4	96												96	0
8-10-76	D	H	0	22.0	47												47	0
8-10-76	D	H	2	22.0	198												198	0
8-10-76	D	H	4	21.7	189												189	0
8-10-76	D	H	6	21.7													0	0
8-10-76	D	H	8	21.8													0	0
8-10-76	N	H	0	21.1	533												533	0
8-10-76	N	H	2	21.0	175												175	0
8-10-76	N	H	4	21.0	48												48	0
8-10-76	N	H	6	21.0	265												265	0
8-10-76	N	H	8	21.0	264												264	0

Appendix 9. Continued.

Sample Parameters					Species/Groups													
Date	DI	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
8-10-76	D	N	0	22.5	23												23	0
8-03-76	D	N	0	21.5	297												297	0
8-10-76	D	N	2	22.0	150												150	0
8-03-76	D	N	2	21.5	28												28	0
8-10-76	N	N	0	21.2	125												125	617
8-10-76	N	N	2	21.2	36												36	0
8-10-76	D	R	0	23.2													0	0
8-10-76	D	R	2	23.5													0	0
8-10-76	D	R	4	23.0	42												42	0
8-10-76	D	R	6	22.8	21												21	0
8-10-76	N	R	0	21.8	288												288	0
8-10-76	N	R	2	22.2	120												120	0
8-10-76	N	R	4	22.2	105												105	0
8-10-76	N	R	6	22.2	169												169	0
8-10-76	D	W	0	21.5	190												190	0
8-10-76	D	W	8	19.5													0	0
8-10-76	D	W	14	15.9	40												40	0
8-10-76	D	W	20	15.9	33												33	0
8-10-76	N	W	0	21.5	62												62	0
8-10-76	N	W	8	19.5													0	0
8-10-76	N	W	14	15.9													0	0
8-10-76	N	W	20	15.9													0	0
8-10-76	D	4	0	24.0													0	0
8-10-76	D	4	3	23.5	72												72	0
8-10-76	D	4	6	23.0	37												37	0
8-10-76	D	4	9	22.0													0	0
8-10-76	D	4	12	21.0													0	0
8-11-76	N	4	0	21.0	882												882	0
8-11-76	N	4	3	21.0	643												643	0
8-11-76	N	4	6	21.0	140												140	0
8-11-76	N	4	9	21.0	95												95	0
8-11-76	N	4	12	21.0	144												144	0

Appendix 9. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
8-10-76	D	5	0	21.8	56												56	0
8-10-76	D	5	4	21.4	62												62	0
8-10-76	D	5	8	20.2	53												53	0
8-10-76	D	5	12	18.5													0	0
8-10-76	D	5	15	18.5													0	0
8-11-76	N	5	0	21.1	410												410	0
8-11-76	N	5	4	21.1	20												20	0
8-11-76	N	5	8	21.1													0	0
8-11-76	N	5	12	21.1	146												146	0
8-11-76	N	5	15	21.1	153												153	0
8-10-76	D	6	0	21.3													0	0
8-10-76	D	6	4	20.5													0	0
8-10-76	D	6	9	19.2													0	0
8-10-76	D	6	14	16.7													0	0
8-10-76	D	6	18	16.7													0	0
8-10-76	N	6	0	21.3													0	0
8-10-76	N	6	4	20.5	93												93	0
8-10-76	N	6	9	19.2	74												74	0
8-10-76	N	6	14	16.7	38												38	0
8-10-76	N	6	18	16.7	25												25	0
9-14-76	D	C	0	22.0													0	0
9-14-76	D	C	2	20.3													0	0
9-14-76	D	C	4	20.3													0	0
9-14-76	D	C	6	20.0													0	0
9-15-76	N	C	0	20.2													0	0
9-15-76	N	C	2	20.2													0	0
9-14-76	N	C	4	19.6													0	0
9-14-76	N	C	6	20.2													0	0
9-14-76	D	D	0	21.5													0	0
9-14-76	D	D	2	19.8													0	0
9-14-76	D	D	4	19.8													0	0
9-14-76	D	D	6	19.8													0	0
9-14-76	D	D	8	19.8													0	0
9-14-76	N	D	0	19.5													0	0
9-14-76	N	D	2	19.0													0	0
9-14-76	N	D	4	19.0													0	0
9-14-76	N	D	6	18.5													0	0
9-14-76	N	D	8	18.5	64												64	0

Appendix 9. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
9-14-76	D	G	0	21.5													0	0
9-14-76	D	G	2	21.0													0	0
9-14-76	D	G	4	21.0													0	0
9-14-76	D	G	6	20.5													0	0
9-14-76	N	G	0	20.5	104												104	0
9-14-76	N	G	2	19.5	24												24	0
9-14-76	N	G	4	19.5	24												24	0
9-14-76	N	G	6	19.5	52												52	0
9-14-76	D	H	0	21.0													0	0
9-14-76	D	H	2	19.8													0	0
9-14-76	D	H	4	19.8													0	0
9-14-76	D	H	6	19.8													0	0
9-14-76	D	H	8	19.5													0	0
9-14-76	N	H	0	20.5													0	0
9-14-76	N	H	2	20.0	24												24	0
9-14-76	N	H	4	20.0													0	0
9-14-76	N	H	6	18.5													0	0
9-14-76	N	H	8	18.5													0	0
9-14-76	D	R	0	20.5													0	0
9-14-76	D	R	2	20.3	87												87	0
9-14-76	D	R	4	20.3													0	0
9-14-76	D	R	6	20.3													0	0
9-29-76	N	R	0	20.0	25												25	0
9-29-76	N	R	2	18.9													0	0
9-29-76	N	R	4	20.0													0	0
9-29-76	N	R	6	18.9													0	0
10-19-76	D	C	0	13.3													0	0
10-19-76	D	C	2	13.0													0	0
10-19-76	D	C	4	13.0													0	0
10-19-76	D	C	6	12.5													0	0
10-19-76	N	C	0	13.2													0	0
10-19-76	N	C	2	13.0													0	0
10-19-76	N	C	4	13.0													0	0
10-19-76	N	C	6	12.9													0	0

Appendix 9. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
10-19-76	D	D	0	13.1													0	0
10-19-76	D	D	2	12.8													0	0
10-19-76	D	D	4	12.8													0	0
10-19-76	D	D	6	12.8													0	0
10-19-76	D	D	8	12.5													0	0
10-19-76	N	D	0	13.1													0	0
10-19-76	N	D	2	12.7													0	0
10-19-76	N	D	4	12.7													0	0
10-19-76	N	D	6	12.7													0	0
10-19-76	N	D	8	12.3													0	0
10-19-76	N	G	0	13.4													0	0
10-19-76	N	G	2	13.0													0	0
10-19-76	N	G	4	13.0													0	0
10-19-76	N	G	6	12.9													0	0
10-19-76	N	H	0	13.3													0	0
10-19-76	N	H	2	13.3													0	0
10-19-76	N	H	4	13.2													0	0
10-19-76	N	H	6	13.2													0	0
10-19-76	N	H	8	13.0													0	0
10-19-76	D	R	0	14.5													0	0
10-19-76	D	R	2	14.1													0	0
10-19-76	D	R	4	14.1													0	0
10-19-76	D	R	6	13.8													0	0
10-19-76	N	R	0	14.3													0	0
10-19-76	N	R	2	13.5													0	0
10-19-76	N	R	4	13.5													0	0
10-19-76	N	R	6	12.3													0	0

Appendix 10. Densities (no./1,000 m^3) for fish eggs and larvae collected at beach (A, B, F) and open water (C, D, G, H, E, W, R) stations in Cook Plant study areas, southeastern Lake Michigan, 1977.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
4-11-77	D	A	0	13.8													0	0
4-11-77	D	A	0	13.8													0	0
4-11-77	N	A	0	11.2													0	0
4-11-77	N	A	0	11.2													0	0
4-11-77	D	B	0	13.5													0	0
4-11-77	D	B	0	13.5													0	0
4-11-77	N	B	0	10.5													0	0
4-11-77	N	B	0	10.5													0	0
4-11-77	D	F	0	12.2													0	0
4-11-77	D	F	0	12.2													0	0
4-11-77	N	F	0	10.8													0	0
4-11-77	N	F	0	10.8													0	0
5-17-77	D	A	0	17.0													0	0
5-17-77	D	A	0	17.0													0	0
5-17-77	N	A	0	17.5													0	0
5-17-77	N	A	0	17.5													0	0
5-17-77	D	B	0	16.8													0	0
5-17-77	D	B	0	16.8													0	0
5-17-77	N	B	0	17.5													0	0
5-17-77	N	B	0	17.5													0	0
5-17-77	D	F	0	18.1													0	0
5-17-77	D	F	0	18.1													0	0
5-17-77	N	F	0	17.0													0	0
5-17-77	N	F	0	17.0													0	0
6-13-77	D	A	0	15.4													0	0
6-13-77	D	A	0	15.4	79												79	159
6-13-77	N	A	0	14.2													0	78
6-13-77	N	A	0	14.2	168			84									252	0

Appendix 10. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
6-13-77	D	B	0	15.4													0	0
6-13-77	D	B	0	15.4	85												85	0
6-13-77	N	B	0	14.5	77												77	154
6-13-77	N	B	0	14.5	88												88	88
6-13-77	D	F	0	15.5	230												230	231
6-13-77	D	F	0	15.5													0	523
6-13-77	N	F	0	14.2	132												132	396
6-13-77	N	F	0	14.2													0	112
7-12-77	D	A	0	22.0	1265	506											1771	3295
7-12-77	D	A	0	22.0	2783	1013											3796	506
7-12-77	N	A	0	22.5	520	260			1041								1821	260
7-12-77	N	A	0	22.5	2990	4557				1041						XP: 130	8718	0
7-12-77	D	B	0	20.3	10480	374											10854	374
7-12-77	D	B	0	20.3	2994												2994	187
7-12-77	N	B	0	23.0	21458	32203											53661	0
7-12-77	N	B	0	23.0	11290	24858											36148	0
7-12-77	D	F	0	23.1	420												420	0
7-12-77	D	F	0	23.1	29015	210											29225	0
7-12-77	N	F	0	20.0	3864	3864											7728	0
7-12-77	N	F	0	20.0	4830	16425											21255	0
8-09-77	D	A	0	23.2	810	813											1623	0
8-09-77	D	A	0	23.2	648												648	0
8-10-77	N	A	0	23.2	466	116											582	0
8-10-77	N	A	0	23.2		116											116	0
8-09-77	D	B	0	23.0	1208												1208	0
8-09-77	D	B	0	23.0	302												302	0
8-10-77	N	B	0	23.0		145											145	0
8-10-77	N	B	0	23.3	290												290	0

Appendix 10. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
8-09-77	D	F	0	22.5	190												190	0
8-09-77	D	F	0	22.5	1140												1140	0
8-10-77	N	F	0	24.3	828												828	0
8-10-77	N	F	0	24.3													0	0
9-12-77	D	A	0	18.5	486												486	243
9-12-77	D	A	0	18.5	250												250	0
9-12-77	N	A	0	18.0													0	0
9-12-77	N	A	0	18.0													0	0
9-12-77	D	B	0	18.3	781												781	130
9-12-77	D	B	0	18.3	111												111	0
9-12-77	N	B	0	18.0													0	0
9-12-77	N	B	0	18.0													0	0
9-12-77	D	F	0	19.0	288												288	0
9-12-77	D	F	0	19.0	6799												6799	0
9-12-77	N	F	0	18.4													0	0
9-12-77	N	F	0	18.4													0	0
10-10-77	D	A	0	13.9	380												380	0
10-10-77	D	A	0	13.9													0	0
10-10-77	N	A	0	11.7													0	0
10-10-77	N	A	0	11.7	105												105	0
10-10-77	D	B	0	13.0													0	0
10-10-77	D	B	0	13.0	333												333	0
10-10-77	N	B	0	12.7													0	0
10-10-77	N	B	0	12.7													0	0
10-10-77	D	F	0	13.3	185												185	0
10-10-77	D	F	0	13.3													0	0
10-10-77	N	F	0	12.5	113												113	0
10-10-77	N	F	0	12.5													0	0

Appendix 10. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
11-08-77	D	A	0	11.8	252												252	0
11-08-77	D	A	0	11.8	390												390	0
11-08-77	N	A	0	11.7													0	0
11-08-77	N	A	0	11.7													0	0
11-08-77	D	B	0	11.4													0	0
11-08-77	D	B	0	11.4													0	0
11-08-77	N	B	0	11.3													0	0
11-08-77	N	B	0	11.3													0	0
11-08-77	D	F	0	11.9													0	0
11-08-77	D	F	0	11.9													0	0
11-08-77	N	F	0	7.9													0	0
11-08-77	N	F	0	7.9													0	0
4-17-77	D	C	0	12.7													0	0
4-17-77	D	C	2	10.9													0	0
4-17-77	D	C	4	10.9													0	0
4-17-77	D	C	6	10.7													0	0
4-17-77	N	C	0	10.8													0	0
4-17-77	N	C	2	9.8													0	0
4-17-77	N	C	4	9.8													0	0
4-17-77	N	C	6	9.6													0	0
4-17-77	D	D	0	12.2													0	0
4-17-77	D	D	2	9.6													0	0
4-17-77	D	D	4	9.6													0	0
4-17-77	D	D	6	9.3													0	0
4-17-77	D	D	8	9.3													0	0
4-17-77	N	D	0	10.9													0	0
4-17-77	N	D	2	10.4													0	0
4-17-77	N	D	4	10.4													0	0
4-17-77	N	D	6	10.4													0	0
4-17-77	N	D	8	9.4													0	0

Appendix 10. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
4-17-77	D	G	0	13.2													0	0
4-17-77	D	G	2	10.6													0	0
4-17-77	D	G	4	10.6													0	0
4-17-77	D	G	6	9.8													0	0
4-17-77	N	G	0	12.5													0	0
4-17-77	N	G	2	10.0													0	0
4-17-77	N	G	4	10.0													0	0
4-17-77	N	G	6	10.0													0	0
4-17-77	D	H	0	11.6													0	0
4-17-77	D	H	2	10.2													0	0
4-17-77	D	H	4	10.2													0	0
4-17-77	D	H	6	10.2													0	0
4-17-77	D	H	8	10.2													0	0
4-17-77	N	H	0	13.8													0	0
4-17-77	N	H	2	9.8													0	0
4-17-77	N	H	4	9.8													0	0
4-17-77	N	H	6	9.8													0	0
4-17-77	N	H	8	8.8													0	0
4-17-77	D	R	0	11.6													0	0
4-17-77	D	R	2	10.8													0	0
4-17-77	D	R	4	10.8													0	0
4-17-77	D	R	6	10.6													0	0
4-17-77	N	R	0	10.6													0	0
4-17-77	N	R	2	10.6													0	0
4-17-77	N	R	4	10.6													0	0
4-17-77	N	R	6	10.2													0	0
5-18-77	D	C	0	19.0													0	0
5-18-77	D	C	2	16.0													0	0
5-18-77	D	C	4	16.0													0	0
5-18-77	D	C	6	16.0													0	0
5-19-77	N	C	0	17.8	30												30	0

Appendix 10. Continued.

Sample Parameters					Species/Groups													
Date	DI	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
5-19-77	D	D	0	18.7													0	0
5-19-77	D	D	2	17.7													0	0
5-19-77	D	D	4	17.7													0	0
5-19-77	D	D	6	17.7													0	0
5-19-77	D	D	8	16.7													0	0
5-17-77	D	E	0	13.0													0	0
5-17-77	D	E	8	11.0													0	0
5-17-77	D	E	14	11.0													0	0
5-17-77	D	E	20	10.5													0	0
5-17-77	N	E	0	12.0													0	0
5-17-77	N	E	8	11.5													0	0
5-17-77	N	E	14	11.5													0	0
5-17-77	N	E	20	10.5													0	0
5-19-77	D	G	0	17.2													0	0
5-19-77	D	G	2	17.7													0	0
5-19-77	D	G	4	17.7													0	0
5-19-77	D	G	6	19.5													0	0
5-19-77	D	H	0	20.0													0	0
5-19-77	D	H	2	18.0													0	0
5-19-77	D	H	4	18.0													0	0
5-19-77	D	H	6	18.0													0	0
5-19-77	D	H	8	18.0													0	0
5-18-77	D	R	0	18.5													0	0
5-18-77	D	R	2	17.0													0	0
5-18-77	D	R	4	17.0													0	0
5-18-77	D	R	6	17.0													0	0
5-19-77	N	R	2	15.7			66										66	0
5-19-77	N	R	4	15.7													0	0
5-19-77	N	R	6	15.2													0	0
5-19-77	D	W	0	16.5													0	0
5-19-77	D	W	8	15.2													0	0
5-19-77	D	W	14	15.2													0	0
5-19-77	D	W	20	13.2													0	0
5-17-77	N	W	0	13.5													0	0
5-17-77	N	W	8	12.0													0	0
5-17-77	N	W	14	12.0													0	0
5-17-77	N	W	20	11.0													0	0

Appendix 10. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
6-16-77	D	C	0	18.5	160			32									192	0
6-16-77	D	C	2	16.5	28			57									85	0
6-16-77	D	C	4	16.2	54												54	54
6-16-77	D	C	6	16.2	55												55	555
6-16-77	N	C	0	15.5	80			323									403	80
6-16-77	N	C	2	15.0				145									145	98
6-16-77	N	C	4	15.0	24			24									48	172
6-16-77	N	C	6	14.5	23												23	69
6-15-77	D	D	0	16.0													0	0
6-15-77	D	D	2	15.0	25			102									127	0
6-15-77	D	D	4	15.0				28									28	0
6-15-77	D	D	6	15.0			40	120									160	0
6-16-77	D	D	8	14.5				134									134	0
6-16-77	N	D	0	15.0	28			431									459	0
6-16-77	N	D	2	14.7	35			105									140	0
6-16-77	N	D	4	14.7													0	70
6-16-77	N	D	6	14.7													0	0
6-16-77	N	D	8	14.5				45									45	0
6-14-77	D	E	0	15.8													0	0
6-14-77	D	E	8	15.1				107									107	0
6-14-77	D	E	14	15.1	43												43	0
6-14-77	D	E	20	12.1													0	0
6-15-77	N	E	0	15.5	42			29									71	0
6-15-77	N	E	8	15.5													0	0
6-15-77	N	E	14	15.5													0	22
6-15-77	N	E	20	15.5													0	0
6-15-77	D	G	0	16.5													0	0
6-15-77	D	G	2	16.0	298			37									335	0
6-15-77	D	G	4	16.0				24									24	0
6-15-77	D	G	6	15.8	31												31	436
6-15-77	N	G	0	16.0	326			140									466	23
6-15-77	N	G	2	15.5	48			218									266	0
6-15-77	N	G	4	15.5	92			91									183	46
6-16-77	N	G	6	15.5	69												69	23

Appendix 10. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
6-16-77	D	H	0	19.8	258												258	0
6-16-77	D	H	2	17.5													0	0
6-16-77	D	H	4	17.5	72												72	0
6-16-77	D	H	6	17.5	198			32									230	0
6-16-77	D	H	8	17.0													0	0
6-15-77	N	H	0	16.0				1050									1050	0
6-15-77	N	H	2	15.0				532									532	0
6-15-77	N	H	4	15.0				32									32	0
6-15-77	N	H	6	15.0	112												112	0
6-15-77	N	H	8	15.0						18							18	0
6-15-77	D	R	0	17.0													0	0
6-15-77	D	R	2	15.5													0	0
6-15-77	D	R	4	15.5	31			94									125	0
6-15-77	D	R	6	14.5				370									370	0
6-16-77	N	R	0	16.0	212											XP: 106	318	0
6-16-77	N	R	2	15.2	42			42									84	170
6-16-77	N	R	4	15.2	112			54									166	168
6-16-77	N	R	6	14.2	58												58	640
6-14-77	D	W	0	15.2													0	0
6-14-77	D	W	8	15.1													0	0
6-14-77	D	W	14	15.1													0	0
6-14-77	D	W	20	12.1													0	0
6-15-77	N	W	0	16.5	14			14									28	0
6-15-77	N	W	8	14.5	34			35									69	0
6-15-77	N	W	14	14.5	44			21									65	0
6-15-77	N	W	20	14.0													0	0
7-12-77	D	C	0	21.7	13												13	0
7-12-77	D	C	2	21.0	40												40	0
7-12-77	D	C	4	21.0	1295												1295	0
7-12-77	D	C	6	21.0	311												311	0
7-27-77	N	C	0	19.6													0	0
7-27-77	N	C	2	19.6													0	0
7-27-77	N	C	4	19.6	30												30	0
7-27-77	N	C	6	19.6	52												52	0

Appendix 10. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
7-12-77	D	D	0	22.3	72												72	0
7-12-77	D	D	2	20.2	1072												1072	0
7-12-77	D	D	4	20.2	2559					13							2572	0
7-12-77	D	D	6	20.2	72												72	0
7-12-77	D	D	8	19.2	350												350	0
7-27-77	N	D	0	19.6	30												30	0
7-27-77	N	D	2	19.6	60												60	0
7-27-77	N	D	4	19.6													0	0
7-27-77	N	D	6	19.6													0	0
7-27-77	N	D	8	19.6													0	0
7-12-77	D	E	0	21.0													0	0
7-12-77	D	E	8	19.7				15									15	0
7-12-77	D	E	14	19.7	15												15	0
7-12-77	D	E	20	16.4	34												34	0
7-28-77	N	E	0	11.8													0	0
7-28-77	N	E	8	11.8													0	0
7-28-77	N	E	14	11.8													0	0
7-28-77	N	E	20	11.8													0	0
7-12-77	D	G	0	21.9													0	0
7-12-77	D	G	2	21.2	16												16	0
7-12-77	D	G	4	21.2	678												678	0
7-12-77	D	G	6	21.3	155												155	0
7-27-77	N	G	0	19.6	54												54	0
7-27-77	N	G	2	19.6	62												62	0
7-27-77	N	G	4	19.6	33												33	0
7-27-77	N	G	6	19.6	180												180	0
7-12-77	D	H	0	21.8													0	0
7-12-77	D	H	2	20.3	241												241	0
7-12-77	D	H	4	20.3	1608												1608	0
7-12-77	D	H	6	20.3	54												54	0
7-12-77	D	H	8	17.4	139												139	0
7-27-77	N	H	0	19.6													0	0
7-27-77	N	H	2	19.6													0	0
7-27-77	N	H	4	19.6													0	0
7-27-77	N	H	6	19.6													0	0
7-27-77	N	H	8	19.6													0	0

Appendix 10. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
7-12-77	D	R	0	20.7	15	15											30	0
7-12-77	D	R	2	20.3	208												208	0
7-12-77	D	R	4	20.3	805	20											825	0
7-12-77	D	R	6	20.3	1021											XP: 19	1040	0
7-27-77	N	R	0	19.6	36												36	0
7-27-77	N	R	2	19.6	97												97	0
7-27-77	N	R	4	19.6	630												630	2345
7-27-77	N	R	6	19.6	357												357	0
7-12-77	D	W	0	21.3													0	0
7-12-77	D	W	8	19.8	14												14	0
7-12-77	D	W	14	19.8													0	0
7-12-77	D	W	20	12.7													0	0
7-28-77	N	W	0	11.8													0	0
7-28-77	N	W	8	11.8	78												78	0
7-28-77	N	W	14	11.8													0	0
7-28-77	N	W	20	11.8													0	0
8-09-77	D	C	0	19.4	342												342	0
8-09-77	D	C	2	19.4	57												57	0
8-09-77	D	C	4	19.4	146												146	0
8-09-77	D	C	6	19.4	136												136	0
8-10-77	N	C	0	23.2	512												512	0
8-10-77	N	C	2	21.9	321												321	0
8-10-77	N	C	4	21.9	75												75	0
8-10-77	N	C	6	21.5	150												150	0
8-09-77	D	D	0	21.5	85												85	0
8-09-77	D	D	2	21.5	34												34	0
8-09-77	D	D	4	21.5	29												29	0
8-09-77	D	D	6	21.5													0	0
8-09-77	D	D	8	21.5	53												53	0
8-10-77	N	D	0	22.5	93												93	0
8-10-77	N	D	2	22.0	210												210	0
8-10-77	N	D	4	22.0	64												64	0
8-10-77	N	D	6	22.0	25												25	0
8-10-77	N	D	8	21.5													0	0

Appendix 10. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
8-09-77	D	E	0	21.2													0	0
8-09-77	D	E	8	9.0													0	0
8-09-77	D	E	14	9.0													0	0
8-09-77	D	E	20	8.3													0	0
8-11-77	N	E	0	22.5	175												175	0
8-11-77	N	E	8	21.5	87												87	0
8-11-77	N	E	14	21.5	28												28	0
8-11-77	N	E	20	19.5													0	0
8-09-77	D	G	0	22.2	119												119	0
8-09-77	D	G	2	21.8	64												64	0
8-09-77	D	G	4	21.8	34												34	0
8-09-77	D	G	6	21.8	282												282	0
8-10-77	N	G	0	24.0	186												186	0
8-10-77	N	G	2	22.5	257												257	0
8-10-77	N	G	4	22.5	138												138	0
8-10-77	N	G	6	22.2	64												64	0
8-09-77	D	H	0	19.4	32												32	0
8-09-77	D	H	2	19.4	102												102	0
8-09-77	D	H	4	19.4	170												170	0
8-09-77	D	H	6	19.4	481												481	0
8-09-77	D	H	8	19.4													0	0
8-11-77	N	H	0	23.5	256												256	0
8-10-77	N	H	2	22.5	290												290	0
8-10-77	N	H	4	22.5	193												193	0
8-10-77	N	H	6	22.5	245												245	0
8-10-77	N	H	8	22.0	181												181	0
8-09-77	D	R	0	19.4	36												36	0
8-09-77	D	R	2	19.4	34												34	0
8-09-77	D	R	4	19.4	64												64	0
8-09-77	D	R	6	19.4	181												181	0
8-10-77	N	R	0	23.8	124												124	0
8-10-77	N	R	2	23.0	180												180	0
8-10-77	N	R	4	23.0	125												125	0
8-10-77	N	R	6	22.5	96												96	0

Appendix 10. Continued.

Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
8-09-77	D	W	0	21.9													0	0
8-09-77	D	W	8	8.2	36												36	0
8-09-77	D	W	14	8.2													0	0
8-09-77	D	W	20	7.9													0	0
8-11-77	N	W	0	23.2	1032												1032	0
8-11-77	N	W	8	22.0	265												265	0
8-11-77	N	W	14	22.0	199												199	0
8-11-77	N	W	20	14.9													0	0
9-13-77	D	C	0	19.5													0	0
9-13-77	D	C	2	19.5													0	0
9-13-77	D	C	4	19.5													0	0
9-13-77	D	C	6	19.5													0	0
9-15-77	N	C	0	10.0													0	0
9-15-77	N	C	2	10.0													0	0
9-15-77	N	C	4	10.0													0	0
9-15-77	N	C	6	10.0													0	0
9-13-77	D	D	0	19.2													0	0
9-13-77	D	D	2	19.2													0	0
9-13-77	D	D	4	19.2	15												15	0
9-13-77	D	D	6	19.2													0	0
9-13-77	D	D	8	19.0													0	0
9-15-77	N	D	0	10.0													0	0
9-15-77	N	D	2	10.0													0	0
9-15-77	N	D	4	10.0													0	0
9-15-77	N	D	6	10.0													0	0
9-15-77	N	D	8	10.0													0	0
9-13-77	D	E	0	19.0													0	0
9-13-77	D	E	8	19.0													0	0
9-13-77	D	E	14	19.0													0	0
9-13-77	D	E	20	19.0													0	0
9-13-77	D	G	0	19.5													0	0
9-13-77	D	G	2	19.5													0	0
9-13-77	D	G	4	19.5													0	0
9-13-77	D	G	6	19.9													0	0
9-15-77	N	G	0	9.5													0	0
9-15-77	N	G	2	9.0													0	0
9-15-77	N	G	4	9.0													0	0
9-15-77	N	G	6	9.0													0	0

Appendix 10. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
9-13-77	D	H	0	19.5													0	0
9-13-77	D	H	2	19.5													0	0
9-13-77	D	H	4	19.5													0	0
9-13-77	D	H	6	19.5													0	0
9-13-77	D	H	8	20.0													0	0
9-15-77	N	H	0	9.5													0	0
9-15-77	N	H	2	9.5													0	0
9-15-77	N	H	4	9.5													0	0
9-15-77	N	H	6	9.5													0	0
9-15-77	N	H	8	9.5													0	0
9-13-77	D	R	0	20.0													0	0
9-13-77	D	R	2	20.0													0	0
9-13-77	D	R	4	20.0													0	0
9-13-77	D	R	6	19.5													0	0
9-15-77	N	R	0	10.0													0	0
9-15-77	N	R	2	10.0													0	0
9-15-77	N	R	4	10.0													0	0
9-15-77	N	R	6	10.0													0	0
9-13-77	D	W	0	19.1													0	0
9-13-77	D	W	8	18.8													0	0
9-13-77	D	W	14	18.8													0	0
9-13-77	D	W	20	13.0													0	0

Appendix 11. Densities (no./1,000 m^3) for fish eggs and larvae collected at beach (A, B, F) and open water (C, D, G, H, E, W, R) stations in Cook Plant study areas, southeastern Lake Michigan, 1978.

Sample Parameters					Species/Groups													
Date	DI	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
4-10-78	D	A	0	6.5													0	0
4-10-78	D	A	0	6.5													0	0
4-12-78	N	A	0	5.6													0	0
4-12-78	N	A	0	5.6													0	0
4-10-78	D	B	0	7.0								512					512	0
4-10-78	D	B	0	7.0													0	0
4-12-78	N	B	0	5.5													0	0
4-12-78	N	B	0	6.0													0	0
4-10-78	D	F	0	5.0													0	0
4-10-78	D	F	0	5.0	126												126	0
4-12-78	N	F	0	6.0													0	0
4-12-78	N	F	0	6.0													0	0
5-08-78	D	A	0	11.9												XS: 380	380	0
5-08-78	D	A	0	11.9												XX: 141	141	0
5-08-78	N	A	0	10.0													0	0
5-08-78	N	A	0	10.0													0	414
5-08-78	D	B	0	10.0													0	0
5-08-78	D	B	0	10.0													0	0
5-08-78	N	B	0	10.0			1320										1320	0
5-08-78	N	B	0	10.0			133	669									802	3480
5-08-78	D	F	0	10.5								190					190	0
5-08-78	D	F	0	10.0													0	0
5-08-78	N	F	0	10.8					72								72	0
5-08-78	N	F	0	10.8													0	1791
6-14-78	D	A	0	10.0													0	0
6-14-78	D	A	0	10.0													0	0
6-13-78	N	A	0	14.0	412	103		103									618	47144
6-13-78	N	A	0	14.0	337			338									675	41694

Appendix 11. Continued.

Sample Parameters					Species/Groups													
Date	DI	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
6-14-78	D	B	0	9.5													0	0
6-14-78	D	B	0	9.5													0	0
6-13-78	N	B	0	15.7	229	114		114									457	1032
6-13-78	N	B	0	15.7	116	699		116									931	2680
6-14-78	D	F	0	12.0													0	0
6-14-78	D	F	0	12.0													0	0
6-13-78	N	F	0	16.0	93	93											186	19221
6-13-78	N	F	0	15.5	669	223		335									1227	8933
7-10-78	D	A	0	14.0	404												404	20202
7-10-78	D	A	0	14.0	1880												1880	75329
7-10-78	N	A	0	10.5	1876	469											2345	76525
7-11-78	N	A	0	10.5	666	2666											3332	41333
7-10-78	D	B	0	15.0	2730												2730	31420
7-10-78	D	B	0	15.5	2499	208											2707	16666
7-10-78	N	B	0	10.5	408		408										816	38036
7-10-78	N	B	0	10.5	1010												1010	36363
7-10-78	D	F	0	14.2	3397												3397	37771
7-10-78	D	F	0	14.2	1824												1824	27397
7-10-78	N	F	0	9.0	327												327	26186
7-10-78	N	F	0	9.0	763												763	19120
8-09-78	D	A	0	25.2	984												984	246
8-09-78	D	A	0	25.2	1970												1970	493
8-09-78	N	A	0	21.5	816	272											1088	1360
8-09-78	N	A	0	21.5	615	493											1108	1358
8-09-78	D	B	0	22.0	896												896	0
8-09-78	D	B	0	21.5	3920											XH: 112	4032	0
8-08-78	N	B	0	21.5	546												546	1202
8-08-78	N	B	0	21.5	1122	562											1684	803

Appendix 11. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
8-09-78	D	F	0	23.0	7828												7828	0
8-09-78	D	F	0	23.0	664												664	0
8-08-78	N	F	0	21.0	1441												1441	0
8-08-78	N	F	0	21.0	328	658											986	0
9-11-78	D	A	0	28.2													0	0
9-11-78	D	A	0	28.2													0	0
9-11-78	N	A	0	27.0					149								149	0
9-11-78	N	A	0	27.0													0	0
9-11-78	D	B	0	26.3													0	0
9-11-78	D	B	0	26.3													0	0
9-11-78	N	B	0	25.0	120												120	0
9-11-78	N	B	0	25.5													0	0
9-11-78	D	F	0	25.5													0	0
9-11-78	D	F	0	25.5													0	0
9-11-78	N	F	0	25.6													0	0
9-11-78	N	F	0	25.6													0	0
10-09-78	D	A	0	14.4	397												397	0
10-09-78	D	A	0	14.4													0	0
10-09-78	N	A	0	14.0	72												72	0
10-09-78	N	A	0	14.0													0	0
10-09-78	D	B	0	14.4	111												111	0
10-09-78	D	B	0	14.4	220												220	0
10-09-78	N	B	0	14.0													0	0
10-09-78	N	B	0	13.5													0	0
10-09-78	D	F	0	14.5													0	0
10-09-78	D	F	0	14.5	75												75	0
10-09-78	N	F	0	13.8													0	0
10-09-78	N	F	0	13.8													0	0

Appendix 11. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
11-16-78	D	A	0	9.6	115												115	0
11-16-78	D	A	0	9.6													0	0
11-16-78	N	A	0	10.0													0	0
11-16-78	N	A	0	10.0													0	0
11-16-78	D	B	0	9.0													0	0
11-16-78	D	B	0	9.0													0	0
11-15-78	N	B	0	9.0													0	0
11-15-78	N	B	0	9.0													0	0
11-16-78	D	F	0	8.5													0	0
11-16-78	D	F	0	8.5													0	0
11-15-78	N	F	0	8.5													0	0
11-15-78	N	F	0	8.5													0	0
4-11-78	D	C	0	3.9													0	0
4-11-78	D	C	2	3.9													0	0
4-11-78	D	C	4	3.9								30					30	0
4-11-78	D	C	6	3.9													0	0
4-27-78	N	C	0	9.5													0	0
4-27-78	N	C	2	6.0													0	0
4-27-78	N	C	4	6.0								73					73	0
4-27-78	N	C	6	6.0													0	0
4-11-78	D	D	0	3.5													0	0
4-11-78	D	D	2	3.5													0	0
4-11-78	D	D	4	3.5													0	0
4-11-78	D	D	6	3.5													0	0
4-11-78	D	D	8	3.5													0	0
4-27-78	N	D	0	8.0													0	0
4-27-78	N	D	2	8.0													0	0
4-27-78	N	D	4	7.0													0	0
4-27-78	N	D	6	7.0													0	0
4-27-78	N	D	8	6.0											65		65	0

Appendix 11. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
4-11-78	D	E	0	1.9													0	0
4-11-78	D	E	8	1.6													0	0
4-11-78	D	E	20	1.6													0	0
4-28-78	N	E	0	6.0													0	0
4-28-78	N	E	8	5.0													0	0
4-28-78	N	E	14	5.0													0	0
4-27-78	N	E	20	5.0													0	0
4-11-78	D	G	0	4.3													0	0
4-11-78	D	G	2	4.3													0	0
4-11-78	D	G	4	4.3													0	0
4-11-78	D	G	6	4.3													0	0
4-27-78	N	G	0	9.0				23									23	0
4-27-78	N	G	2	6.5													0	0
4-27-78	N	G	4	6.5													0	0
4-27-78	N	G	6	6.5													0	0
4-11-78	D	H	0	4.1													0	0
4-11-78	D	H	2	4.1													0	0
4-11-78	D	H	4	4.1													0	0
4-11-78	D	H	6	4.1													0	0
4-11-78	D	H	8	4.1													0	0
4-27-78	N	H	0	9.0													0	0
4-27-78	N	H	2	6.5													0	0
4-27-78	N	H	4	6.5								50					50	0
4-27-78	N	H	6	6.5													0	0
4-27-78	N	H	8	6.5													0	0
4-11-78	D	R	0	3.2													0	0
4-11-78	D	R	2	3.2													0	0
4-11-78	D	R	4	3.2													0	0
4-11-78	D	R	6	3.2													0	0
4-27-78	N	R	0	9.5													0	0
4-27-78	N	R	2	7.0													0	0
4-27-78	N	R	4	7.0													0	0
4-27-78	N	R	6	7.0													0	0

Appendix 11. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
4-11-78	D	W	0	2.0													0	0
4-11-78	D	W	8	1.8													0	125
4-11-78	D	W	14	1.8													0	0
4-11-78	D	W	20	1.8													0	0
4-27-78	N	W	0	6.0													0	0
4-27-78	N	W	8	5.5													0	0
4-27-78	N	W	14	5.5													0	0
4-27-78	N	W	20	5.5													0	0
5-10-78	D	C	0	10.1													0	0
5-10-78	D	C	2	9.2													0	0
5-10-78	D	C	4	9.2													0	0
5-10-78	D	C	6	8.5													0	0
5-10-78	N	C	0	8.5													0	0
5-10-78	N	C	2	8.5													0	0
5-10-78	N	C	4	8.5													0	0
5-10-78	N	C	6	7.7													0	0
5-10-78	D	D	0	8.1													0	0
5-10-78	D	D	2	8.1													0	0
5-10-78	D	D	4	8.1													0	0
5-10-78	D	D	6	8.1													0	0
5-10-78	D	D	8	8.1													0	0
5-10-78	N	D	0	10.5													0	0
5-10-78	N	D	2	10.0													0	0
5-10-78	N	D	4	10.0													0	0
5-10-78	N	D	6	10.0													0	0
5-10-78	N	D	8	7.5													0	0
5-10-78	D	E	0	7.2													0	0
5-10-78	D	E	8	6.7													0	0
5-10-78	D	E	14	6.7													0	0
5-10-78	D	E	20	6.6													0	0
5-10-78	N	E	0	14.0													0	0
5-10-78	N	E	8	9.5													0	0
5-10-78	N	E	14	9.5			56										56	0
5-10-78	N	E	20	6.0													0	0

Appendix 11. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
5-10-78	D	G	0	10.4													0	0
5-10-78	D	G	2	9.5													0	0
5-10-78	D	G	4	9.5													0	0
5-10-78	D	G	6	9.4													0	0
5-10-78	N	G	0	8.3													0	0
5-10-78	N	G	2	8.6													0	0
5-10-78	N	G	4	8.6													0	0
5-10-78	N	G	6	8.6			36										36	0
5-10-78	D	H	0	10.5													0	0
5-10-78	D	H	2	8.6													0	0
5-10-76	D	H	4	8.6													0	0
5-10-78	D	H	6	8.6													0	0
5-10-78	D	H	8	8.6													0	0
5-10-78	N	H	0	13.5													0	0
5-10-78	N	H	2	12.0													0	0
5-10-78	N	H	4	12.0													0	0
5-10-78	N	H	6	12.0			33										33	0
5-10-78	N	H	8	9.0													0	0
5-10-78	D	R	0	9.7												XS: 22	22	244
5-10-78	D	R	2	9.2													0	0
5-10-78	D	R	4	9.2													0	0
5-10-78	D	R	6	8.3													0	0
5-10-78	N	R	0	9.0													0	0
5-10-78	N	R	2	8.5													0	0
5-10-78	N	R	4	8.5													0	0
5-10-78	N	R	6	7.0													0	0
5-10-78	D	W	0	8.8													0	0
5-10-78	D	W	8	6.5													0	0
5-10-78	D	W	14	6.5													0	0
5-10-78	D	W	20	6.0													0	0
5-10-78	N	W	0	14.0													0	0
5-10-78	N	W	8	12.0													0	0
5-10-73	N	W	14	12.0													0	0
5-10-78	N	W	20	6.0													0	0

Appendix 11. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
6-14-78	D	C	0	6.8													0	0
6-14-78	D	C	2	5.8													0	0
6-14-78	D	C	4	5.8													0	0
6-14-78	D	C	6	6.0				94									94	0
6-22-78	N	C	0	16.0		36		36									72	0
6-22-78	N	C	2	16.5	292											UC: 58	350	0
6-22-78	N	C	4	16.5				100								UC: 100		
																XM: 100	300	1594
6-22-78	N	C	6	16.0	104												104	0
6-14-78	D	D	0	6.3													0	0
6-14-78	D	D	2	5.8													0	0
6-14-78	D	D	4	5.8													0	0
6-14-78	D	D	6	5.3													0	0
6-14-78	D	D	8	5.8				43									43	0
6-22-78	N	D	0	16.5	376											XP: 125	501	0
6-22-78	N	D	2	15.0	108												108	545
6-22-78	N	D	4	15.0	204			288									492	102
6-22-78	N	D	6	15.0													0	971
6-22-78	N	D	8	11.0													0	220
6-14-78	D	E	0	12.0													0	0
6-14-78	D	E	8	5.0													0	0
6-14-78	D	E	14	5.0													0	0
6-14-78	D	E	20	4.5													0	0
6-23-78	N	E	0	16.5				97									97	0
6-23-78	N	E	8	12.5													0	433
6-23-78	N	E	14	11.5			52										52	58
6-23-78	N	E	20	11.5													0	1286
6-14-78	D	G	0	13.0	110			55									165	0
6-14-78	D	G	2	9.0													0	0
6-14-78	D	G	4	9.0													0	0
6-14-78	D	G	6	9.0			56	112									168	0
6-22-78	N	G	0	17.0	79												79	0
6-22-78	N	G	2	16.5	38												38	2325
6-22-78	N	G	4	16.5	93												93	0
6-22-78	N	G	6	13.5	1326											XP: 255	1581	0

Appendix 11. Continued.

Sample Parameters					Species/Groups													
Date	DI	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
6-14-78	D	H	0	13.0	88			44									132	0
6-14-78	D	H	2	9.0	54			54									108	0
6-14-78	D	H	4	9.0		19	19										38	0
6-14-78	D	H	6	8.0													0	0
6-14-78	D	H	8	8.0	40												40	0
6-23-78	N	H	0	17.0				32									32	0
6-23-78	N	H	2	15.5	43												43	1869
6-23-78	N	H	4	15.5													0	0
6-22-78	N	H	6	15.5				136								XP: 136	272	1257
6-22-78	N	H	8	11.5													0	0
6-14-78	D	R	0	6.0													0	0
6-14-78	D	R	2	6.0													0	0
6-14-78	D	R	4	6.2													0	0
6-14-78	D	R	6	6.8													0	0
6-22-78	N	R	0	17.5													0	0
6-22-78	N	R	2	15.5													0	0
6-22-78	N	R	4	15.5													0	0
6-22-78	N	R	6	14.0													0	2553
6-14-78	D	W	0	14.0													0	0
6-14-78	D	W	8	14.0													0	0
6-14-78	D	W	14	14.0													0	0
6-14-78	D	W	20	11.0													0	0
6-23-78	N	W	0	16.5				24									24	398
6-23-78	N	W	8	15.0	94												94	47
6-23-78	N	W	14	15.0	58												58	1453
6-23-78	N	W	20	10.0													0	614
7-11-78	D	C	0	8.0													0	0
7-11-78	D	C	2	8.0													0	0
7-11-78	D	C	4	8.0													0	0
7-11-78	D	C	6	8.0													0	0
7-11-78	N	C	0	11.0													0	0
7-11-78	N	C	2	9.0	197			197									394	0
7-11-78	N	C	4	9.0													0	0
7-11-78	N	C	6	6.5													0	0

Appendix 11, Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
7-11-78	D	D	0	9.0													0	0
7-11-78	D	D	2	6.8	61												61	0
7-11-78	D	D	4	6.8													0	0
7-11-78	D	D	6	6.8													0	0
7-11-78	D	D	8	6.0													0	0
7-11-78	N	D	0	9.5													0	0
7-11-78	N	D	2	8.0													0	0
7-11-78	N	D	4	8.0													0	0
7-11-78	N	D	6	8.0													0	0
7-11-78	N	D	8	6.0													0	0
7-11-78	D	E	0	12.0													0	0
7-11-78	D	E	8	7.0													0	0
7-11-78	D	E	14	7.0													0	0
7-11-78	D	E	20	7.0	14												14	0
7-12-78	N	E	0	11.5													0	0
7-12-78	N	E	8	9.0													0	0
7-12-78	N	E	14	9.0													0	0
7-12-78	N	E	20	5.3													0	0
7-11-78	D	G	0	9.9													0	0
7-11-78	D	G	2	7.8													0	0
7-11-78	D	G	4	7.8													0	0
7-11-78	D	G	6	8.0													0	0
7-12-78	N	G	0	8.5													0	0
7-12-78	N	G	2	7.0													0	0
7-11-78	N	G	4	7.0													0	0
7-11-78	N	G	6	6.5													0	0
7-11-78	D	H	0	8.5													0	0
7-11-78	D	H	2	7.0													0	0
7-11-78	D	H	4	7.0													0	0
7-11-78	D	H	6	7.0													0	0
7-11-78	D	H	8	7.0													0	0
7-12-78	N	H	0	9.0	119												119	0
7-12-78	N	H	2	7.5													0	0
7-12-78	N	H	4	7.5													0	0
7-12-78	N	H	6	7.5													0	0
7-12-78	N	H	8	6.0													0	0

Appendix 11. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
7-11-78	D	R	0	12.0													0	0
7-11-78	D	R	2	8.0													0	0
7-11-78	D	R	4	8.0													0	0
7-11-78	D	R	6	7.0													0	0
7-11-78	N	R	0	11.8													0	0
7-11-78	N	R	2	9.8													0	0
7-11-78	N	R	4	9.8													0	0
7-11-78	N	R	6	6.0													0	0
7-11-78	D	W	0	14.0													0	0
7-11-78	D	W	8	10.0													0	0
7-11-78	D	W	14	10.0													0	0
7-11-78	D	W	20	5.5													0	0
7-12-78	N	W	0	13.5													0	0
7-12-78	N	W	8	6.0													0	0
7-12-78	N	W	14	6.0													0	0
7-12-78	N	W	20	5.0													0	0
8-09-78	D	C	0	21.8	18												18	0
8-09-78	D	C	2	21.8													0	0
8-09-78	D	C	4	21.8	225												225	0
8-09-78	D	C	6	22.0	856											XP: 35	891	0
8-29-78	N	C	0	23.5	34												34	0
8-29-78	N	C	2	23.5	26												26	0
8-29-78	N	C	4	23.5													0	0
8-29-78	N	C	6	22.5	50												50	0
8-09-78	D	D	0	22.0													0	0
8-09-78	D	D	2	21.8	180												180	0
8-09-78	D	D	4	21.8	148												148	0
8-09-78	D	D	6	21.8	130												130	0
8-09-78	D	D	8	21.8	461												461	0
8-30-78	N	D	0	23.0													0	0
8-30-78	N	D	2	22.5	18												18	0
8-30-78	N	D	4	22.5													0	0
8-29-78	N	D	6	22.5	15												15	0
8-29-78	N	D	8	22.0													0	0

Appendix 11. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
8-09-78	D	E	0	21.5													0	0
8-09-78	D	E	8	18.8													0	0
8-09-78	D	E	14	18.8													0	0
8-09-78	D	E	20	7.5													0	0
8-30-78	N	E	0	22.0													0	0
8-30-78	N	E	8	20.5													0	0
8-30-78	N	E	14	20.5													0	0
8-30-78	N	E	20	17.0													0	0
8-09-78	D	G	0	22.0													0	0
8-09-78	D	G	2	22.0	18												18	0
8-09-78	D	G	4	22.0	176												176	0
8-09-78	D	G	6	22.2	176	26											202	0
8-30-78	N	G	0	23.0	18												18	0
8-30-78	N	G	2	22.5	72												72	0
8-30-78	N	G	4	22.5	18												18	0
8-30-78	N	G	5	22.0													0	0
8-09-78	D	H	0	21.8													0	0
8-09-78	D	H	2	21.8	108												108	0
8-09-78	D	H	4	21.8	34												34	0
8-09-78	D	H	6	21.8	34												34	0
8-09-78	D	H	8	21.8	48												48	0
8-30-78	N	H	0	22.5													0	0
8-30-78	N	H	2	22.5													0	0
8-30-78	N	H	4	22.5													0	0
8-30-78	N	H	6	22.5													0	0
8-30-78	N	H	8	22.5													0	0
8-09-78	D	R	0	22.8	128											XP: 18	146	0
8-09-78	D	R	2	21.8							17						17	0
8-09-78	D	R	4	21.8	38												38	0
8-09-78	D	R	6	21.8	425	38					19					XP: 19	501	0
8-29-78	N	R	0	24.0													0	0
8-29-78	N	R	2	24.0													0	0
8-29-78	N	R	4	23.0	23												23	0
8-29-78	N	R	6	24.0													0	0

Appendix 11. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
8-09-78	D	W	0	21.8													0	0
8-09-78	D	W	8	18.0													0	0
8-09-78	D	W	14	18.0													0	0
8-09-78	D	W	20	7.5													0	0
8-30-78	N	W	0	22.5													0	0
8-30-78	N	W	8	22.4													0	0
8-30-78	N	W	14	22.0													0	0
8-30-78	N	W	20	22.0													0	0
9-12-78	D	C	0	26.9													0	0
9-12-78	D	C	2	26.1													0	0
9-12-78	D	C	4	26.1													0	0
9-12-78	D	C	6	24.2													0	0
9-12-78	D	D	0	29.1													0	0
9-12-78	D	D	2	28.0													0	0
9-12-78	D	D	4	28.0													0	0
9-12-78	D	D	6	28.0													0	0
9-12-78	D	D	8	17.5													0	0
9-28-78	N	D	0	17.0	50												50	0
9-28-78	N	D	2	17.0	104												104	0
9-28-78	N	D	4	17.0	270												270	0
9-28-78	N	D	6	17.0	96												96	0
9-28-78	N	D	8	16.5													0	0
9-12-78	D	E	0	23.3													0	0
9-12-78	D	E	8	19.8													0	0
9-12-78	D	E	14	19.8													0	0
9-12-78	D	E	20	9.1													0	0
9-12-78	D	G	0	26.0													0	0
9-12-78	D	G	2	26.0													0	0
9-12-78	D	G	4	26.0													0	0
9-12-78	D	G	6	26.0													0	0
9-28-78	N	G	0	16.5	46												46	0
9-28-78	N	G	2	16.5													0	0
9-28-78	N	G	4	16.5													0	0
9-28-78	N	G	6	16.5													0	0

Appendix 11. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
9-12-78	D	H	0	24.8													0	0
9-12-78	D	H	2	24.4													0	0
9-12-78	D	H	4	24.4													0	0
9-12-78	D	H	6	24.4													0	0
9-12-78	D	H	8	19.0													0	0
9-28-78	N	H	0	16.5													0	0
9-28-78	N	H	2	16.5	38												38	0
9-28-78	N	H	4	16.5													0	0
9-28-78	N	H	6	16.5	52												52	0
9-28-78	N	H	8	16.0													0	0
9-12-78	D	R	0	24.0													0	0
9-12-78	D	R	2	24.0													0	0
9-12-78	D	R	4	23.8													0	0
9-12-78	D	R	6	24.0													0	0
9-12-78	D	W	0	24.0													0	0
9-12-78	D	W	8	20.1													0	0
9-12-78	D	W	14	20.1													0	0
9-12-78	D	W	20	9.9													0	0

Appendix 12. Densities (no./1,000 m^3) for fish eggs and larvae collected at beach (A, B, F) and open water (C, D, G, H, E, W, R) stations in Cook Plant study areas, southeastern Lake Michigan, 1979.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
4-12-79	D	A	0	9.5													0	0
4-12-79	D	A	0	9.5													0	0
4-11-79	N	A	0	4.0													0	0
4-11-79	N	A	0	4.0													0	0
4-12-79	D	B	0	7.7													0	0
4-12-79	D	B	0	7.7													0	0
4-11-79	N	B	0	4.0													0	0
4-11-79	N	B	0	4.0													0	0
4-12-79	D	F	0	8.0													0	0
4-12-79	D	F	0	8.0													0	0
4-11-79	N	F	0	4.0													0	0
4-11-79	N	F	0	4.0													0	0
5-07-79	D	A	0	15.0								136					136	408
5-07-79	D	A	0	15.0													0	956
5-07-79	N	A	0	13.0													0	0
5-07-79	N	A	0	13.0				128									128	0
5-07-79	D	B	0	14.5													0	0
5-07-79	D	B	0	14.5			189										189	0
5-07-79	N	B	0	13.0													0	0
5-07-79	N	B	0	13.0				70									70	140
5-07-79	D	F	0	13.5													0	0
5-07-79	D	F	0	13.5													0	0
5-07-79	N	F	0	12.5													0	0
5-07-79	N	F	0	12.5													0	0
6-11-79	D	A	0	18.5				137									137	549
6-11-79	D	A	0	18.5				736									736	2025
6-12-79	N	A	0	16.5		512		512									1024	0
6-12-79	N	A	0	16.5													0	0

Appendix 12. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
6-11-79	D	B	0	18.5		340											340	1020
6-11-79	D	B	0	18.5		307											307	1025
6-12-79	N	B	0	16.5		3853											3853	0
6-12-79	N	B	0	16.5		3657											3657	0
6-11-79	D	F	0	18.0		120											120	42042
6-11-79	D	F	0	18.0													0	59007
6-11-79	N	F	0	17.0		901		150		150							1201	752
6-11-79	N	F	0	17.0		436		109									545	0
7-11-79	D	A	0	25.5	1450	290											1740	145
7-11-79	D	A	0	25.5	2552	196											2748	0
7-11-79	N	A	0	21.4	945	10603											11548	757
7-11-79	N	A	0	21.4	5836	4089											9925	1364
7-11-79	D	B	0	25.3	1903												1903	0
7-11-79	D	B	0	25.3	1254	139											1393	0
7-11-79	N	B	0	21.7	1576	4730											6306	197
7-11-79	N	B	0	21.7	5753	3355											9108	0
7-11-79	D	F	0	24.0													0	0
7-11-79	D	F	0	24.0	364												364	1092
7-11-79	N	F	0	22.0	1625	7722											9347	0
7-11-79	N	F	0	21.5	3454	20527											23981	0
8-08-79	D	A	0	26.0	102												102	0
8-08-79	D	A	0	26.0	307												307	0
8-08-79	N	A	0	23.7	707	425											1132	0
8-08-79	N	A	0	23.7	876	292											1168	0
8-08-79	D	B	0	25.6													0	0
8-08-79	D	B	0	25.6	999												999	0
8-07-79	N	B	0	23.0		125											125	0
8-07-79	N	B	0	23.0	336												336	0

Appendix 12. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
8-08-79	D	F	0	25.1													0	0
8-08-79	D	F	0	25.1													0	0
8-07-79	N	F	0	24.1	718	479											1197	0
8-07-79	N	F	0	24.1	577												577	0
9-12-79	D	A	0	23.0	1277												1277	0
9-12-79	D	A	0	23.0	6627												6627	0
9-12-79	N	A	0	21.4	355												355	0
9-12-79	N	A	0	21.4													0	0
9-12-79	D	B	0	21.5	820												820	0
9-12-79	D	B	0	21.5	5964												5964	0
9-12-79	N	B	0	20.8	3508												3508	0
9-12-79	N	B	0	20.8	1746												1746	0
9-12-79	D	F	0	20.9	378												378	0
9-12-79	D	F	0	20.9	126												126	0
9-12-79	N	F	0	21.0													0	0
9-12-79	N	F	0	21.0													0	0
10-08-79	D	A	0	16.7	1447												1447	0
10-08-79	D	A	0	16.7	263												263	0
10-10-79	N	A	0	14.2													0	0
10-10-79	N	A	0	14.2													0	0
10-08-79	D	B	0	16.0	1050												1050	0
10-08-79	D	B	0	16.0	9846												9846	0
10-10-79	N	B	0	13.8	211												211	0
10-10-79	N	B	0	13.8													0	0
10-08-79	D	F	0	14.2	952												952	0
10-08-79	D	F	0	14.2													0	0
10-10-79	N	F	0	13.2													0	0
10-10-79	N	F	0	13.2													0	0

Appendix 12. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
11-14-79	D	A	0	9.0													0	0
11-14-79	D	A	0	9.0													0	0
11-14-79	N	A	0	8.9													0	0
11-14-79	N	A	0	8.9													0	0
11-14-79	D	B	0	9.3													0	0
11-14-79	D	B	0	9.3													0	0
11-14-79	N	B	0	8.9													0	0
11-14-79	N	B	0	8.9													0	0
11-14-79	D	F	0	7.6													0	0
11-14-79	D	F	0	7.6													0	0
11-14-79	N	F	0	7.3													0	0
11-14-79	N	F	0	7.3													0	0
4-10-79	D	C	0	4.0													0	0
4-10-79	D	C	2	4.0													0	0
4-10-79	D	C	4	4.0													0	0
4-10-79	D	C	6	4.0													0	0
4-19-79	N	C	0	6.5													0	0
4-19-79	N	C	2	6.5													0	0
4-19-79	N	C	4	6.5													0	0
4-19-79	N	C	6	5.5													0	0
4-10-79	D	D	0	2.5													0	0
4-10-79	D	D	2	2.5													0	0
4-10-79	D	D	4	2.5													0	0
4-10-79	D	D	6	2.5													0	0
4-10-79	D	D	8	2.8													0	0
4-19-79	N	D	0	5.5													0	0
4-19-79	N	D	2	6.0													0	0
4-19-79	N	D	4	6.0													0	0
4-19-79	N	D	6	6.0													0	0
4-19-79	N	D	8	5.5													0	0

Appendix 12. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
4-10-79	D	E	0	2.5													0	0
4-10-79	D	E	8	2.0													0	0
4-10-79	D	E	14	2.0													0	0
4-10-79	D	E	20	2.0													0	0
4-11-79	N	E	0	2.5													0	0
4-11-79	N	E	8	2.5													0	0
4-10-79	N	E	14	2.5													0	0
4-10-79	N	E	20	2.5													0	0
4-10-79	D	G	0	3.0													0	0
4-10-79	D	G	2	3.0													0	0
4-10-79	D	G	4	3.0													0	0
4-10-79	D	G	6	3.0													0	0
4-11-79	N	G	0	2.5													0	0
4-11-79	N	G	2	2.5													0	0
4-11-79	N	G	4	2.5													0	0
4-11-79	N	G	6	2.5													0	0
4-10-79	D	H	0	2.5													0	0
4-10-79	D	H	2	2.5													0	0
4-10-79	D	H	4	2.5													0	0
4-10-79	D	H	6	2.5													0	0
4-10-79	D	H	8	2.5													0	0
4-11-79	N	H	0	2.5													0	0
4-11-79	N	H	2	2.5													0	0
4-11-79	N	H	4	2.5													0	0
4-11-79	N	H	6	2.5													0	0
4-11-79	N	H	8	2.5													0	0
4-10-79	D	R	0	3.0													0	0
4-10-79	D	R	2	3.0													0	0
4-10-79	D	R	4	3.0													0	0
4-10-79	D	R	6	3.0													0	0
4-19-79	N	R	0	6.5													0	0
4-19-79	N	R	2	6.5													0	0
4-19-79	N	R	4	6.5													0	0
4-19-79	N	R	6	6.0													0	0

Appendix 12. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
4-10-79	D	W	0	2.0													0	0
4-10-79	D	W	8	2.0													0	0
4-10-79	D	W	14	2.0													0	0
4-10-79	D	W	20	1.8													0	0
4-11-79	N	W	0	1.5													0	0
4-11-79	N	W	8	1.5													0	0
4-11-79	N	W	14	1.5													0	0
4-11-79	N	W	20	1.5													0	0
5-08-79	D	C	0	12.2													0	0
5-08-79	D	C	2	12.2													0	0
5-08-79	D	C	4	12.2													0	0
5-08-79	D	C	6	12.2													0	0
5-10-79	N	C	0	12.0													0	0
5-10-79	N	C	2	10.0													0	0
5-10-79	N	C	4	10.0			243										243	0
5-10-79	N	C	6	9.5			72										72	0
5-08-79	D	D	0	11.0													0	0
5-08-79	D	D	2	11.0													0	0
5-08-79	D	D	4	11.0													0	0
5-08-79	D	D	6	11.0													0	0
5-08-79	D	D	8	11.0													0	0
5-10-79	N	D	0	11.6													0	0
5-10-79	N	D	2	9.9			320										320	0
5-10-79	N	D	4	9.9			76										76	0
5-10-79	N	D	6	9.9													0	0
5-10-79	N	D	8	9.9													0	0
5-08-79	D	E	0	8.0													0	0
5-08-79	D	E	8	8.0													0	0
5-08-79	D	E	14	8.0													0	0
5-08-79	D	E	20	8.0													0	0
5-09-79	N	E	0	10.7			33										33	0
5-09-79	N	E	8	7.9													0	0
5-09-79	N	E	14	7.9													0	0
5-10-79	N	E	20	6.9													0	0

Appendix 12. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
5-08-79	D	G	0	11.0													0	0
5-08-79	D	G	2	11.0													0	0
5-08-79	D	G	4	11.0			27										27	0
5-08-79	D	G	6	11.0			33										33	0
5-09-79	N	G	0	13.4			62										62	0
5-09-79	N	G	2	10.5													0	0
5-09-79	N	G	4	10.5													0	0
5-09-79	N	G	6	10.5													0	0
5-08-79	D	H	0	10.9													0	0
5-08-79	D	H	2	10.9													0	0
5-08-79	D	H	4	10.9													0	0
5-08-79	D	H	6	10.9													0	0
5-08-79	D	H	8	10.9											27		27	0
5-09-79	N	H	0	13.6													0	0
5-09-79	N	H	2	10.2													0	0
5-09-79	N	H	4	10.2													0	0
5-09-79	N	H	6	10.2													0	0
5-09-79	N	H	8	9.7													0	0
5-08-79	D	R	0	10.3													0	0
5-08-79	D	R	2	10.3													0	0
5-08-79	D	R	4	10.3													0	0
5-08-79	D	R	6	10.3													0	0
5-10-79	N	R	0	11.4													0	0
5-10-79	N	R	2	10.8													0	0
5-10-79	N	R	4	10.8			82										82	0
5-10-79	N	R	6	10.8													0	0
5-08-79	D	W	0	8.0													0	0
5-08-79	D	W	8	8.0													0	0
5-08-79	D	W	14	8.0													0	0
5-08-79	D	W	20	8.0													0	0
5-09-79	N	W	0	9.0													0	0
5-09-79	N	W	8	7.2													0	0
5-09-79	N	W	14	7.2													0	0
5-09-79	N	W	20	6.2													0	0

Appendix 12. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
6-12-79	D	C	0	17.0													0	0
6-12-79	D	C	2	16.0													0	0
6-12-79	D	C	4	16.0			13										13	0
6-12-79	D	C	6	16.5												XP: 14	14	0
6-13-79	N	C	0	14.8													0	751
6-13-79	N	C	2	13.8													0	1668
6-13-79	N	C	4	13.8		65											65	32625
6-13-79	N	C	6	13.0			73										73	27140
6-12-79	D	D	0	17.0													0	0
6-12-79	D	D	2	16.0													0	0
6-12-79	D	D	4	16.0			19										19	0
6-12-79	D	D	6	16.0			12										12	0
6-12-79	D	D	8	15.0				22									22	0
6-13-79	N	D	0	14.8													0	366
6-13-79	N	D	2	13.1			48										48	48
6-13-79	N	D	4	13.1													0	0
6-13-79	N	D	6	13.1													0	355
6-13-79	N	D	8	12.0													0	329
6-12-79	D	E	0	16.0													0	0
6-12-79	D	E	8	11.2													0	0
6-12-79	D	E	14	11.2			12										12	0
6-12-79	D	E	20	11.2													0	0
6-13-79	N	E	0	16.0													0	0
6-13-79	N	E	8	16.0			23										23	47
6-13-79	N	E	14	15.0			42										42	66
6-13-79	N	E	20	11.2												XP: 22	22	0
6-12-79	D	G	0	17.2													0	0
6-12-79	D	G	2	16.5													0	0
6-12-79	D	G	4	16.5													0	0
6-12-79	D	G	6	16.3				12									12	0
6-12-79	N	G	0	16.0				71									71	0
6-13-79	N	G	2	15.0				44									44	0
6-12-79	N	G	4	15.0													0	43
6-12-79	N	G	6	14.0		466										XP: 193	659	0

Appendix 12. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
6-12-79	D	H	0	16.5													0	0
6-12-79	D	H	2	15.5													0	0
6-12-79	D	H	4	15.5				18									18	0
6-12-79	D	H	6	15.5				13									13	0
6-12-79	D	H	8	14.5													0	0
6-13-79	N	H	0	15.2			27	27									54	27
6-13-79	N	H	2	14.3													0	0
6-13-79	N	H	4	14.3													0	45
6-13-79	N	H	6	14.3			89										89	0
6-13-79	N	H	8	13.0			56										56	0
6-12-79	D	R	0	17.4													0	0
6-12-79	D	R	2	17.2				17									17	0
6-12-79	D	R	4	17.2													0	0
6-12-79	D	R	6	16.2													0	0
6-13-79	N	R	0	14.3													0	435
6-13-79	N	R	2	13.5													0	8823
6-13-79	N	R	4	13.5													0	15242
6-13-79	N	R	6	13.5													0	1515
6-12-79	D	W	0	16.0													0	0
6-12-79	D	W	8	11.5								18					18	0
6-12-79	D	W	14	11.5			12										12	0
6-12-79	D	W	20	10.0												XP: 14	14	0
6-13-79	N	W	0	16.0													0	0
6-13-79	N	W	8	13.0				27									27	28
6-13-79	N	W	14	13.0													0	0
6-13-79	N	W	20	11.8			23										23	0
7-10-79	D	C	0	19.0													0	0
7-10-79	D	C	2	17.5	130												130	0
7-10-79	D	C	4	17.5	1608			59									1667	0
7-10-79	D	C	6	17.5	98			13									111	0
7-11-79	N	C	0	21.1	4323												4323	108
7-11-79	N	C	2	17.7	11320	31		31									11382	15044
7-11-79	N	C	4	17.7	3507	53		103									3663	11376
7-11-79	N	C	6	17.2	2723	194											2917	0

Appendix 12. Continued.

Sample Parameters					Species/Groups													
Date	DI	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
7-10-79	D	D	0	19.0													0	0
7-10-79	D	D	2	17.5	365												365	0
7-10-79	D	D	4	17.5	1414			34									1448	0
7-10-79	D	D	6	17.5	386			80									466	0
7-10-79	D	D	8	17.2	243			19									262	0
7-10-79	N	D	0	21.0	1178												1178	127
7-10-79	N	D	2	18.2	2429												2429	57
7-10-79	N	D	4	18.2	2289	42										XP: 85	2416	0
7-10-79	N	D	6	18.2	1312												1312	0
7-10-79	N	D	8	17.0	1288												1288	0
7-10-79	D	E	0	20.0	173												173	0
7-10-79	D	E	8	15.0	79			40									119	0
7-10-79	D	E	14	15.0													0	0
7-10-79	D	E	20	12.0	19												19	0
7-10-79	N	E	0	20.5	2001			32									2033	0
7-10-79	N	E	8	17.4	309			43									352	0
7-10-79	N	E	14	17.4	123		76										199	41
7-10-79	N	E	20	13.1	45												45	0
7-10-79	D	G	0	20.0	13												13	0
7-10-79	D	G	2	18.5	214												214	0
7-10-79	D	G	4	18.5	2881			13									2894	0
7-10-79	D	G	6	18.5	218			14									232	0
7-10-79	N	G	0	22.7	3306												3306	0
7-10-79	N	G	2	17.8	290			28									318	0
7-10-79	N	G	4	17.8	743			63									806	0
7-10-79	N	G	6	17.1	495												495	0
7-10-79	D	H	0	18.8	56												56	0
7-10-79	D	H	2	18.0	1244												1244	0
7-10-79	D	H	4	18.0	3668			27									3695	0
7-10-79	D	H	6	18.0	757			15	15								787	0
7-10-79	D	H	8	17.5	64												64	0
7-10-79	N	H	0	21.8	1767												1767	0
7-10-79	N	H	2	17.5	660	30		149									839	0
7-10-79	N	H	4	17.5	878	67		33									978	0
7-10-79	N	H	6	17.5	2064			32									2096	0
7-10-79	N	H	8	16.5	993		70									XP: 70	1133	0

Appendix 12. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
7-10-79	D	R	0	19.0													0	0
7-10-79	D	R	2	18.0	115												115	0
7-10-79	D	R	4	18.0	1517			94									1611	0
7-10-79	D	R	6	18.0	530			90									620	0
7-11-79	N	R	0	20.8	1181												1181	809
7-11-79	N	R	2	19.0	7712			30								XP: 92	7834	3733
7-11-79	N	R	4	19.0	10932			40									10972	12456
7-11-79	N	R	6	16.8	8031	42		84									8157	25867
7-10-79	D	W	0	20.0													0	0
7-10-79	D	W	8	15.0	12			24									36	0
7-10-79	D	W	14	15.0				57									57	0
7-10-79	D	W	20	13.0	15												15	0
7-10-79	N	W	0	20.5	3215			60									3275	0
7-10-79	N	W	8	16.0	363		44										407	0
7-10-79	N	W	14	16.0	172			80								XP: 40	292	0
7-10-79	N	W	20	15.0													0	0
8-08-79	D	C	0	23.5													0	0
8-08-79	D	C	2	23.5	13												13	0
8-08-79	D	C	4	23.5	338												338	0
8-08-79	D	C	6	23.8	165												165	0
8-16-79	N	C	0	21.0	804												804	0
8-16-79	N	C	2	19.5	240												240	0
8-16-79	N	C	4	19.5	196												196	0
8-16-79	N	C	6	19.1	224												224	0
8-08-79	D	D	0	24.2													0	0
8-08-79	D	D	2	23.0	62												62	0
8-08-79	D	D	4	23.0	182												182	0
8-08-79	D	D	6	23.0	28												28	0
8-08-79	D	D	8	23.0	13												13	0
8-16-79	N	D	0	21.5	70												70	0
8-16-79	N	D	2	21.5	116												116	0
8-16-79	N	D	4	19.5	37												37	0
8-16-79	N	D	6	19.5	66												66	0
8-16-79	N	D	8	19.1	160												160	0

Appendix 12. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
8-08-79	D	E	0	22.5													0	0
8-08-79	D	E	8	14.8	22												22	0
8-08-79	D	E	14	14.8													0	0
8-08-79	D	E	20	7.5			11										11	0
8-17-79	N	E	0	19.5													0	0
8-17-79	N	E	8	19.5	107												107	0
8-17-79	N	E	14	19.5													0	0
8-17-79	N	E	20	19.5	54												54	0
8-08-79	D	G	0	24.0	201												201	0
8-08-79	D	G	2	23.7	1278												1278	0
8-08-79	D	G	4	23.7	1296											XP: 83	1379	0
8-08-79	D	G	6	23.7	162												162	0
8-16-79	N	G	0	19.7	54												54	0
8-16-79	N	G	2	19.7	289		48										337	0
8-16-79	N	G	4	19.7	245												245	0
8-16-79	N	G	6	19.1													0	0
8-08-79	D	H	0	23.8	28												28	0
8-08-79	D	H	2	22.8	1208											XP: 36	1244	0
8-08-79	D	H	4	22.8	84												84	0
8-08-79	D	H	6	22.8	70												70	0
8-08-79	D	H	8	22.4	126											XP: 13	139	0
8-16-79	N	H	0	19.5	539												539	0
8-16-79	N	H	2	19.5	572												572	0
8-16-79	N	H	4	19.5	204												204	0
8-16-79	N	H	6	19.5	84												84	0
8-16-79	N	H	8	19.0	114												114	0
8-08-79	D	R	0	24.5													0	0
8-08-79	D	R	2	24.5	194											XP: 16	210	0
8-08-79	D	R	4	24.5	728											XP: 27	755	0
8-08-79	D	R	6	24.5	281											XP: 14	295	0
8-16-79	N	R	0	20.8	45												45	0
8-16-79	N	R	2	20.8	205												205	0
8-16-79	N	R	4	20.8	220												220	0
8-16-79	N	R	6	18.8	252												252	0

Appendix 12. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
8-08-79	D	W	0	22.0													0	0
8-08-79	D	W	8	10.0	18												18	0
8-08-79	D	W	14	10.0	16												16	0
8-08-79	D	W	20	7.0													0	0
8-17-79	N	W	0	20.0													0	0
8-17-79	N	W	8	19.7	57												57	0
8-17-79	N	W	14	19.7	54												54	0
8-17-79	N	W	20	19.7													0	0
9-12-79	D	C	0	20.0													0	0
9-12-79	D	C	2	19.5													0	0
9-12-79	D	C	4	19.5													0	0
9-12-79	D	C	6	19.5													0	0
9-11-79	N	C	0	20.1	38												38	0
9-11-79	N	C	2	19.8	34												34	0
9-11-79	N	C	4	19.8													0	0
9-11-79	N	C	6	19.0													0	0
9-12-79	D	D	0	19.7													0	0
9-12-79	D	D	2	19.5													0	0
9-12-79	D	D	4	19.5													0	0
9-12-79	D	D	6	19.5													0	0
9-12-79	D	D	8	19.5													0	0
9-11-79	N	D	0	21.5	38												38	0
9-11-79	N	D	2	20.0	40												40	0
9-11-79	N	D	4	20.0	32												32	0
9-11-79	N	D	6	20.0	58												58	0
9-11-79	N	D	8	18.0													0	0
9-12-79	D	E	0	20.0													0	0
9-12-79	D	E	8	15.0													0	0
9-12-79	D	E	14	15.0													0	0
9-12-79	D	E	20	9.0													0	0
9-12-79	D	G	0	20.0													0	0
9-12-79	D	G	2	19.5													0	0
9-12-79	D	G	4	19.5													0	0
9-12-79	D	G	6	19.5													0	0
9-11-79	N	G	0	20.0	34												34	0
9-11-79	N	G	2	20.0													0	0
9-11-79	N	G	4	20.0													0	0
9-11-79	N	G	6	19.0													0	0

Appendix 12. Continued.

Sample Parameters					Species/Groups													
Date	Dl	Sta	Dpt	Temp C	AL	SP	SM	YP	TP	JD	CP	BR	SS	NS	FS	Misc.	Total Larvae	Eggs
9-12-79	D	H	0	19.5													0	0
9-12-79	D	H	2	19.5	14												14	0
9-12-79	D	H	4	19.0													0	0
9-12-79	D	H	6	19.0													0	0
9-12-79	D	H	8	19.0													0	0
9-11-79	N	H	0	20.0													0	0
9-11-79	N	H	2	19.5	33												33	0
9-11-79	N	H	4	19.5													0	0
9-11-79	N	H	6	19.5													0	0
9-11-79	N	H	8	17.1													0	0
9-12-79	D	R	0	19.0													0	0
9-12-79	D	R	2	19.0													0	0
9-12-79	D	R	4	19.0													0	0
9-12-79	D	R	6	19.0													0	0
9-11-79	N	R	0	21.0													0	0
9-11-79	N	R	2	20.5													0	0
9-11-79	N	R	4	20.5													0	0
9-11-79	N	R	6	18.5													0	0
9-12-79	D	W	0	19.0													0	0
9-12-79	D	W	8	15.0													0	0
9-12-79	D	W	14	15.0													0	0
9-12-79	D	W	20	11.0													0	0
9-11-79	N	W	0	19.0													0	0
9-11-79	N	W	8	19.0													0	0
9-11-79	N	W	14	19.0													0	0
9-12-79	N	W	20	17.0													0	0

Appendix 13. Physical and limnological parameters measured during fish larvae field sampling in Cook Plant study areas, southeastern Lake Michigan, 1975-1979. pc. = partly cloudy; ovc. = overcast; ND = no data; var. = variable; dir. = direction. See Fig. 1 for the location of sampling stations.

Date	Start time (EST)	Station	Water temp (C) Surface	Water temp (C) Mid-depth	Water temp (C) Bottom	Wind Dir. from	Wind Speed (mph)	Waves Dir. from	Waves Ht. (m)	Current (Dir. from)	Weather	Secchi disc (m)
1975												
15 Apr	1708	A	8.3	ND	8.7	S	0-5	W	0.2	ND	clear	>0.8
15 Apr	2240	A	6.5	ND	6.5	S	0-5	W	≤ 0.1	S	clear	
15 Apr	1740	B	7.5	ND	7.1	S	0-5	W	≤ 0.1	S	clear	>0.8
15 Apr	2310	B	5.7	ND	5.7	S	0-5	W	≤ 0.1	S	clear	
15 Apr	1612	F	8.1	ND	8.1	S	0-5	W	≤ 0.1	SE	clear	>0.8
15 Apr†	2145	F	6.5	ND	6.5	SE	0-5	W	≤ 0.1	S	clear	
14 Apr	1442	C	3.0	ND	2.2	S	0-5	calm		ND	ovc.	1.3
14 Apr	2241	C	1.0	ND	1.0	NE	0-5	NW	0.2	ND	ovc.	
14 Apr	1515	D	4.8	ND	4.7	NW	5-10	NW	0.2	ND	ovc.	1.7
14 Apr	2120	D	1.0	ND	0.7	ND	0-5	NW	0.2	ND	ovc.	
14 Apr	1621	G	1.9	ND	1.7	NW	0-5	NW	0.2	ND	ovc.	1.8
14 Apr	2023	G	1.1	ND	1.1	NE	0-5	NW	0.2	ND	ovc.	
14 Apr	1655	H	1.6	ND	1.0	NW	0-5	NW	0.2	ND	ovc.	1.5
14 Apr	1942	H	0.5	ND	0.1	NW	5-10	calm		ND	ovc.	
14 Apr	1401	R	4.6	ND	3.9	S	0-5	calm		ND	ovc.	1.4
14 Apr	2321	R	1.4	ND	1.6	calm		calm		ND	ovc.	
16 Apr	1855	E	3.6	ND	3.5	var.	0-5	calm		ND	clear	2.2
16 Apr	2122	E	3.6	ND	3.5	var.	0-5	calm		ND	clear	
16 Apr	1757	W	3.7	ND	3.5	var.	0-5	SW	≤ 0.1	ND	clear	2.0
16 Apr	2034	W	3.7	ND	3.5	var.	0-5	calm		ND	clear	
13 May	1630	A	12.9	ND	12.9	W	0-5	NW	0.2	N	clear	0.6
14 May	0148	A	10.0	ND	10.0	E	10-15	S	0.6-0.9	N	pc.	
13 May	1707	B	12.0	ND	12.0	W	0-5	NW	0.2	N	clear	0.8
14 May	0226	B	9.5	ND	9.5	E	10-15	S	0.6-0.9	N	pc.	
13 May	1550	F	11.8	ND	11.8	W	0-5	NW	0.2	N	clear	1.0
14 May	0105	F	10.1	ND	10.1	E	10-15	S	0.6-0.9	SE	pc.	
14 May	1356	C	10.0	ND	9.0	calm		calm		ND	ovc.	3.0
15 May	2207	C	8.2	ND	8.2	NE	10-15	NW	0.3-0.6	ND	clear	
14 May	1305	D	10.0	ND	8.5	calm		calm		ND	ovc.	3.0
15 May	2124	D	9.0	ND	9.0	NE	10-15	NW	0.3-0.6	ND	clear	
14 May	1633	G	9.5	ND	8.2	calm		calm		ND	ovc.	3.0
14 May	2006	G	9.6	ND	8.6	SE	0-5	S	≤ 0.1	ND	ovc.	
14 May	1546	H	9.8	ND	8.0	SW	0-5	calm		ND	ovc.	3.3
14 May	2037	H	8.8	ND	7.8	S	5-10	S	≤ 0.1	ND	ovc.	
14 May	1114	R	8.8	ND	8.0	SW	0-5	calm		S	pc.	1.9
14 May	2245	R	10.2	ND	7.6	NE	10-15	NW	0.3-0.6	ND	clear	
14 May	1448	E	10.2	ND	5.9	calm		calm		ND	ovc.	3.5
15 May	2044	E	10.1	ND	7.0	NE	10-15	NW	0.4-0.6	ND	clear	
28 May*	1258	E#	17.5	ND	12.5	NE	5-10	NW	0.2-0.6	NW	clear	7.5
28 May*	2200	E#	17.0	ND	13.0	NW	10-15	N	0.6	N	clear	

Appendix 13. Continued.

Date	Start time (EST)	Sta-tion	Water temp (C) Sur-face	Mid-depth	Bot-tom	Wind Dir. from	Speed (mph)	Waves Dir. from	Ht. (m)	Cur-rent (Dir. from)	Weather	Sec-chi disc (m)
1975												
13 May	1559	W	11.5	ND	5.0	calm		calm		ND	clear	4.0
13 May	1950	W	7.3	ND	4.6	calm		calm		ND	clear	
28 May*	1346	4#	18.5	ND	12.0	NE	5-10	NW	0.2-0.6	NW	clear	7.5
28 May*	2246	4#	16.0	ND	13.5	NW	10-15	N	0.6	N	clear	
28 May*	1332	5#	18.5	ND	12.0	NE	5-10	NW	0.2-0.6	NW	clear	7.5
28 May*	2232	5#	16.5	ND	13.5	NW	10-15	N	0.6	N	clear	
28 May*	1316	6#	17.8	ND	12.0	NE	5-10	NW	0.2-0.6	NW	clear	7.5
28 May*	2220	6#	16.0	ND	13.5	NW	10-15	N	0.6	N	clear	
10 Jun*	1418	A	16.0	ND	15.8	E	10-15	N	0.2	N	clear	>2.0
23 Jun	2225	A	22.5	ND	22.3	E	0-5	S	≤0.1	S	ovc.	
24 Jun	1425	A	24.0	ND	23.5	W	0-5	SW	≤0.1	SW	ovc.	>1.5
10 Jun*	1335	B	16.5	ND	15.0	S	10-15	SE	0.2	SE	clear	>2.0
23 Jun	2300	B	22.6	ND	22.5	E	20-25	S	≤0.1	S	pc.	
24 Jun	1450	B	24.0	ND	23.5	W	0-5	calm		E	ovc.	>1.5
10 Jun*	1631	F	13.8	ND	13.8	SE	10-15	NE	≤0.1	NE	clear	>2.0
23 Jun	2122	F	22.9	ND	22.9	E	0-5	S	≤0.1	S	ovc.	
24 Jun	1606	F	23.3	ND	22.9	SW	0-5	SW	≤0.1	SW	ovc.	>1.5
10 Jun	1407	C	17.0	ND	9.2	E	15-20	E	0.2	ND	clear	2.5
10 Jun	2217	C	15.4	8.6	8.5	E	10-15	E	0.2	ND	clear	
10 Jun	1500	D	16.2	15.2	8.7	E	20-25	E	0.2	ND	pc.	2.3
10 Jun	2315	D	14.4	13.5	8.5	E	10-15	E	0.2	ND	ovc.	
10 Jun	1658	G	15.9	11.5	10.5	E	5-10	E	0.2	ND	clear	2.0
11 Jun	0043	G	13.5	8.6	8.0	E	5-10	E	≤0.1	ND	ovc.	
10 Jun	1740	H	16.2	13.1	9.2	E	10-15	E	0.2	ND	pc.	2.5
11 Jun	0126	H	14.5	8.5	7.9	E	5-10	E	0.2	ND	ovc.	
10 Jun	1603	R	17.7	15.8	14.8	E	20-25	E	0.2	ND	clear	2.4
10 Jun	2117	R	16.8	14.6	12.0	E	0-5	E	0.2	ND	pc.	
11 Jun	0700	E	ND	ND	8.3	SE	5-10	SE	≤0.1	ND	pc.	
18 Jun*	1404	E#	21.5	ND	16.3	SE	0-5	calm		ND	pc.	5.0
18 Jun*	2132	E#	19.3	ND	16.5	SE	5-10	SE	0.2	ND	pc.	
25 Jun	0304	E	19.0	13.0	8.0	E	0-5	E	≤0.1	ND	ovc.	
10 Jun	1840	W	17.2	16.9	2.3	E	10-15	E	0.3	ND	pc.	5.0
11 Jun	0225	W	17.0	16.8	8.3	E	10-15	E	0.3-0.4	ND	ovc.	
18 Jun*	1443	4#	21.0	ND	18.5	SE	0-5	SE	≤0.1	ND	pc.	5.0
18 Jun*	2212	4#	19.5	ND	17.4	SE	5-10	SE	0.2	ND	pc.	
18 Jun*	1429	5#	21.0	ND	18.3	SE	0-5	SE	≤0.1	ND	pc.	5.0
18 Jun*	2202	5#	19.4	ND	17.4	SE	5-10	SE	0.2	ND	pc.	
18 Jun*	1418	6#	21.0	ND	18.3	SE	0-5	SE	≤0.1	ND	pc.	5.0
18 Jun*	2148	6#	19.4	ND	17.2	SE	5-10	SE	0.2	ND	pc.	
16 Jul	1415	A	26.4	ND	25.5	calm		SW	≤0.1	S	clear	>1.0
16 Jul	2352	A	24.6	ND	24.6	SW	5-10	SW	0.2	SW	clear	
16 Jul	1500	B	27.7	ND	26.8	W	0-5	E	≤0.1	E	clear	>1.0
17 Jul	0030	B	24.5	ND	24.5	SW	5-10	SW	0.2	SW	clear	
16 Jul	1625	F	26.7	ND	26.4	W	0-5	NW	≤0.1	NW	clear	>1.0
16 Jul	2237	F	24.4	ND	24.4	SW	5-10	SW	0.2	SW	clear	

Appendix 13. Continued.

Date	Start time (EST)	Station	Water temp (C) Surface	Mid-depth	Bottom	Wind Dir. from	Speed (mph)	Waves Dir. from	Ht. (m)	Current (Dir. from)	Weather	Secchi disc (m)
1975												
15 Jul	1304	C	23.9	23.7	23.7	SW	0-5	SW	0.3	ND	clear	4.2
16 Jul	0031	C	22.8	22.5	22.2	E	10-15	E	0.2	ND	clear	
15 Jul	1441	D	23.7	23.2	23.2	SW	0-5	SW	0.3	ND	clear	4.5
15 Jul	2338	D	22.7	22.5	21.7	E	5-10	E	0.2	ND	clear	
31 Jul*	1340	D	24.5	10.5	10.0	N	0-5	NW	≤0.1	ND	clear	2.0
15 Jul	1742	G	23.3	23.1	22.9	SW	0-5	SW	0.2	ND	clear	4.0
15 Jul	2240	G	22.7	21.9	21.9	calm		E	≤0.1	ND	clear	
15 Jul	1818	H	23.6	22.9	22.5	SW	0-5	SW	0.2	ND	clear	4.5
15 Jul	2145	H	22.6	22.1	21.6	calm		calm		ND	clear	
15 Jul	1351	R	23.4	23.2	23.2	SW	0-5	SW	0.3	ND	clear	3.5
16 Jul	0117	R	22.5	22.4	22.3	E	10-15	E	0.2	ND	clear	
15 Jul	1544	E	22.8	22.2	ND	SW	0-5	SW	0.2	ND	clear	7.5
16 Jul	0211	E	22.0	21.1	7.7	E	10-15	E	0.2	ND	clear	
17 Jul*	1405	E#	24.5	ND	11.4	calm		calm		ND	clear	7.5
17 Jul*	2337	E#	22.0	ND	ND	SE	15-20	SE	0.3	ND	clear	
15 Jul	1645	W	23.2	22.0	ND	SW	0-5	SW	0.2	ND	clear	7.1
15 Jul	2114	W	22.3	21.3	ND	calm		calm		ND	clear	
17 Jul*	1444	4#	24.0	ND	11.4	calm		calm		ND	clear	5.0
18 Jul*	0036	4#	22.3	ND	11.4	SE	15-20	SE	0.2	ND	clear	
17 Jul*	1432	5#	25.2	ND	11.4	calm		calm		ND	clear	5.0
18 Jul*	0022	5#	21.4	ND	11.4	SE	15-20	SE	0.2	ND	clear	
17 Jul*	1422	6#	24.5	ND	11.4	calm		calm		ND	clear	5.0
17 Jul*	2355	6#	22.5	ND	11.4	SE	15-20	SE	0.2	ND	clear	
11 Aug	1445	A	22.9	ND	22.9	calm		NW	0.2	ND	clear	>1.0
12 Aug	2225	A	23.0	ND	23.0	S	10-15	SW	0.3	S	clear	
11 Aug	1530	B	23.5	ND	23.5	calm		NW	0.2	ND	clear	>1.0
12 Aug	2304	B	ND	ND	24.0	S	10-15	SW	0.3	S	clear	
11 Aug	1620	F	23.5	ND	23.5	NW	0-5	calm		N	ovc.	>2.0
13 Aug	0004	F	ND	ND	23.0	S	10-15	SW	0.3	SW	clear	
12 Aug	1501	C	24.4	23.0	23.0	SW	5-10	var.	0.2	ND	ovc.	2.5
12 Aug	2255	C	23.5	22.0	21.5	SE	10-15	var.	0.2	ND	clear	
12 Aug	1415	D	23.4	23.0	20.5	SW	5-10	var.	0.3	ND	ovc.	2.7
12 Aug	2342	D	23.3	23.3	17.7	SE	10-15	var.	0.4-0.6	ND	ovc.	
12 Aug	1748	G	24.0	22.6	22.5	SW	5-10	var.	≤0.1	ND	clear	3.0
12 Aug	2159	G	23.8	23.4	21.8	SE	10-15	var.	0.2	ND	clear	
12 Aug	1824	H	23.8	23.0	20.5	SW	0-5	calm		ND	clear	3.0
12 Aug	2108	H	23.8	22.9	21.0	SE	10-15	var.	≤0.1	ND	clear	
12 Aug	1320	R	25.1	23.5	23.0	SW	5-10	var.	0.4	ND	ovc.	2.7
13 Aug	0038	R	24.2	22.3	21.8	SE	10-15	var.	0.8-0.9	ND	ovc.	
12 Aug	1600	E	23.0	9.9	ND	SW	0-5	SW	0-5	ND	clear	3.0
13 Aug	0134	E	22.5	9.9	ND	SE	15-20	var.	0.9-1.0	ND	pc.	
12 Aug	1659	W	24.0	9.2	ND	SW	0-5	calm		ND	clear	3.1
12 Aug	2041	W	24.0	9.2	ND	SW	0-5	var.	≤0.1	ND	clear	
9 Sep	1410	A	20.5	ND	19.2	NE	0-5	W	0.3	NE	clear	1.0
10 Sep	0145	A	18.9	ND	ND	calm		calm		N	clear	

Appendix 13. Continued.

Date	Start time (EST)	Sta- tion	Water temp (C) Sur- face	Mid- depth	Bot- tom	Wind Dir. from	Speed (mph)	Waves Dir. from	Ht. (m)	Cur- rent (Dir. from)	Weather	Sec- chi disc (m)
1975												
9 Sep	1508	B	21.0	ND	20.8	NE	0-5	W	0.3	NE	clear	>1.0
10 Sep	0010	B	18.9	ND	18.9	calm		calm		N	clear	
9 Sep	1555	F	19.8	ND	19.8	NE	0-5	W	0.3	NE	clear	>1.0
9 Sep	2323	F	18.9	ND	18.9	calm		calm		N	clear	
9 Sep	1150	C	21.0	19.0	19.0	NE	0-5	NW	0.2	ND	clear	4.0
11 Sep	0100	C	19.2	19.0	18.4	E	10-15	SE	0.3	ND	clear	
10 Sep	1432	D	20.0	19.5	18.5	S	5-10	SW	0.2	ND	clear	3.0
10 Sep	2350	D	19.2	19.2	19.0	SE	10-15	SE	0.2	ND	clear	
10 Sep	1830	G	19.9	19.3	19.3	SE	5-10	S	≤0.1	ND	clear	3.9
10 Sep	2048	G	19.8	19.0	19.0	SE	5-10	SE	0.2	ND	clear	
10 Sep	1733	H	20.0	19.0	19.0	S	0-5	SW	0.2	ND	clear	4.0
10 Sep	1951	H	19.5	19.5	18.9	SE	5-10	SE	0.2	ND	clear	
10 Sep	1337	R	19.8	19.0	19.0	SW	0-5	SW	0.2	ND	clear	2.9
11 Sep	0150	R	19.8	19.2	19.2	E	10-15	SE	0.3	ND	clear	
10 Sep	1536	E	19.8	18.8	18.8	SW	5-10	SW	0.2	ND	clear	4.0
10 Sep	2235	E	18.8	18.4	18.4	SE	10-15	SE	0.2	ND	clear	
10 Sep	1640	W	19.2	18.9	13.1	SW	0-5	SW	0.3	ND	clear	4.0
10 Sep	2145	W	19.0	18.8	18.8	SE	10-15	SE	0.3	ND	clear	
14 Oct	1740	A	17.8	ND	17.8	SE	10-15	S	0.3	ND	clear	0.8
13 Oct	2321	A	16.5	ND	16.5	S	5-10	S	0.3	ND	clear	
14 Oct	1710	B	18.5	ND	18.8	SE	5-10	SW	0.3	ND	clear	0.8
13 Oct	2357	B	16.3	ND	16.3	S	5-10	S	0.3	ND	clear	
14 Oct	1600	F	16.2	ND	16.2	S	10-15	SW	0.6	ND	clear	0.8
13 Oct	2201	F	17.5	ND	17.5	S	5-10	S	0.3	ND	clear	
14 Oct	1549	C	15.9	ND	15.9	SW	10-15	S	0.3	ND	clear	4.0
16 Oct	2208	C	15.0	14.7	14.7	E	5-10	E	0.3	ND	clear	
14 Oct	1647	D	15.4	ND	15.7	SW	15-20	S	0.3-0.6	ND	clear	4.0
16 Oct	2250	D	14.8	14.8	14.8	NE	10-15	E	0.6	ND	clear	
16 Oct	1650	G	15.1	ND	15.1	N	5-10	W	0.9	ND	pc.	3.0
17 Oct	0052	G	14.7	14.5	14.5	NE	5-10	E	0.6	ND	clear	
16 Oct	1650	H	15.4	15.3	15.3	N	5-10	W	0.9	ND	clear	3.6
17 Oct	0006	H	14.8	14.8	14.8	NE	10-15	E	0.6	ND	clear	
14 Oct	1510	R	15.8	ND	15.6	S	5-10	S	0.3	ND	clear	3.9
16 Oct	2125	R	15.0	14.7	14.7	E	0-5	NW	0.3	ND	clear	
16 Oct	1833	E	14.3	14.2	14.2	N	5-10	N	0.6	ND	clear	6.6
17 Oct	0250	E	14.0	14.0	14.0	NE	15-20	E	0.9-1.5	ND	clear	
16 Oct	1740	W	14.3	ND	14.5	N	5-10	N	0.9	ND	clear	6.6
17 Oct	0147	W	14.0	14.0	14.0	NE	15-20	E	0.9	ND	clear	
4 Nov	1438	A	14.0	ND	14.0	NW	0-5	calm		E	ovc.	>1.0
4 Nov	2310	A	13.4	ND	13.5	calm		calm		NE	clear	
4 Nov	1510	B	15.0	ND	14.1	NW	0-5	W	≤0.1	NE	ovc.	>1.0
4 Nov	2340	B	13.5	ND	13.4	calm		calm		E	clear	
4 Nov	1604	F	13.9	ND	14.1	NW	0-5	W	≤0.1	O	ovc.	>1.0
4 Nov	2215	F	13.9	ND	13.9	W	0-5	calm		O	pc.	
6 Nov	1412	C	13.2	ND	12.4	calm		calm		ND	clear	5.0

Appendix 13. Continued.

Date	Start time (EST)	Sta- tion	Water temp (C) Sur- face	Mid- depth	Bot- tom	Wind Dir. from	Speed (mph)	Waves Dir. from	Ht. (m)	Cur- rent (Dir. from)	Weather	Sec- chi disc (m)
1975												
5 Nov	2218	C	12.9	12.2	11.6	SE	0-5	calm		ND	clear	
6 Nov	1447	D	13.0	12.4	12.4	S	0-5	calm		ND	clear	5.5
5 Nov	2124	D	13.2	12.2	11.9	N	0-5	calm		ND	clear	
6 Nov	1626	G	12.8	ND	12.2	SW	5-10	SW	0.3	ND	ovc.	5.0
5 Nov	2022	G	13.4	12.2	12.4	N	0-5	calm		ND	clear	
6 Nov	1543	H	12.9	12.3	12.3	SW	10-15	SW	0.2-0.3	ND	ovc.	5.0
5 Nov	1931	H	12.9	12.2	12.2	N	0-5	calm		ND	clear	
6 Nov	1327	R	13.0	12.8	12.8	calm		calm		ND	clear	5.0
5 Nov	2300	R	12.9	12.2	12.1	SE	0-5	E	≤0.1	ND	clear	
6 Nov	1240	E	13.8	ND	11.0	W	0-5	calm		ND	clear	5.8
5 Nov	2353	E	11.8	11.2	11.2	E	0-5	calm		ND	clear	
6 Nov	1706	W	12.1	11.5	11.5	SW	0-5	SW	≤0.1	ND	ovc.	ND
1976												
26 Feb	1410	A	7.5	ND	7.5	W	5-10	W	0.2-0.3	N	clear	0.4
26 Feb	2240	A	4.7	ND	4.7	S	5-10	SW	≤0.1	S	pc.	
26 Feb	1513	B	6.2	ND	6.2	W	5-10	W	0.2-0.3	N	clear	0.4
26 Feb	2330	B	5.9	ND	5.9	S	5-10	SW	≤0.1	S	pc.	
12 Apr	1800	A	10.1	ND	10.3	N	0-5	NW	0.3	E	clear	0.4
13 Apr	0219	A	7.9	ND	7.9	var.	0-5	ND	ND	E	ND	
12 Apr	1832	B	9.5	ND	9.5	N	0-5	NW	0.3	E	clear	0.4
13 Apr	0252	B	7.0	ND	7.0	var.	0-5	ND	ND	E	ND	
12 Apr	1700	F	10.3	ND	10.3	N	0-5	NW	0.3	E	clear	0.4
13 Apr	0128	F	7.9	ND	7.9	var.	0-5	ND	ND	E	ND	
14 Apr	1400	C	9.5	9.0	8.2	S	0-5	S	0.2	ND	clear	1.8
14 Apr	0027	C	8.5	8.5	8.5	SE	5-10	SE	0.2	ND	clear	
14 Apr	1527	D	12.4	8.4	7.7	S	0-5	S	≤0.1	ND	clear	1.8
14 Apr	0113	D	7.8	7.6	7.4	SE	0-5	SE	0.2	ND	clear	
14 Apr	1636	G	9.7	ND	9.5	S	10-20	S	0.3	ND	pc.	1.5
13 Apr	2040	G	9.6	8.1	7.8	SE	0-5	calm		ND	clear	
14 Apr	1719	H	9.0	9.0	9.0	S	15-20	S	0.9	ND	pc.	1.6
13 Apr	2126	H	9.0	8.3	7.6	SE	0-5	SE	≤0.1	ND	clear	
14 Apr	1444	R	9.2	8.6	8.6	S	0-5	S	≤0.1	ND	clear	1.8
14 Apr	0210	R	8.2	8.2	8.2	SE	5-10	SE	0.2	ND	clear	
14 Apr	1903	E	7.2	6.1	ND	S	5-10	S	0.4-0.6	ND	pc.	2.2
14 Apr	2318	E	7.0	6.5	ND	SE	0-5	SE	0.2	ND	clear	
14 Apr	1820	W	8.5	6.9	5.7	S	5-10	S	0.6	ND	ovc.	1.8
14 Apr	2228	W	7.3	6.5	ND	SE	0-5	SE	0.2	ND	clear	
10 May	1500	A	17.5	ND	17.0	SW	5-10	ND	ND	S	clear	>1.0
12 May	1400	C	13.1	12.3	11.5	NW	5-10	NW	0.3	ND	clear	1.5
14 May	0028	C	12.2	12.0	11.6	SW	10-15	SW	0.2	ND	ovc., rain	
12 May	1305	D	12.5	11.2	10.8	NW	5-10	NW	0.3	ND	clear	1.8
13 May	2333	D	12.0	11.8	10.5	S	10-15	SE	0.2	ND	ovc., rain	
12 May	1019	G	13.0	12.5	11.0	NW	0-5	NW	0.3	ND	clear	1.5
13 May	2229	G	11.5	11.5	11.5	SE	10-15	SE	0.2	ND	ovc.	
12 May	0922	H	12.0	11.5	11.0	NW	5-10	NW	0.3	ND	clear	1.5
13 May	2129	H	11.3	11.1	11.2	SE	10-15	SE	0.2	ND	ovc.	
12 May	1455	R	13.5	12.0	11.1	NW	5-10	NW	0.3	ND	pc.	1.5
14 May	0107	R	11.6	11.6	11.8	S	0-5	SW	0.2	ND	ovc., fog	

Appendix 13. Continued.

Date	Start time (EST)	Station	Water temp (C) Surface	Mid-depth	Bottom	Wind Dir. from	Speed (mph)	Waves Dir. from	Ht. (m)	Current (Dir. from)	Weather	Secchi disc (m)
1976												
12 May	1211	E	12.3	10.7	9.7	NW	5-10	NW	0.3	ND	clear	2.0
13 May	1933	E	10.2	10.0	ND	SE	5-10	SE	0.2-0.3	ND	ovc., rain	
12 May	1117	W	10.7	9.8	ND	NW	5-10	NW	0.3	ND	clear	2.7
13 May*	2057	W	11.0	11.0	11.0	SE	5-10	SE	0.2	ND	ovc., rain	
14 Jun	1538	A	24.5	ND	23.5	S	0-5	W	0.2	SE	clear	0.8
14 Jun	2340	A	21.5	ND	21.5	S	5-10	calm		S	pc.	
14 Jun	1505	B	24.0	ND	23.0	S	0-5	W	0.2	O	clear	0.8
14 Jun	2300	B	21.5	ND	21.5	S	5-10	calm		S	pc.	
14 Jun	1700	F	23.0	ND	21.8	S	0-5	W	0.2	ND	clear	0.8
14 Jun	2155	F	21.3	ND	21.4	S	5-10	calm		S	pc.	
22 Jun	1723	C	20.9	21.0	14.5	SE	5-10	SW	0.3	S	ovc., rain	2.9
17 Jun*	1500	D	20.5	20.0	19.2	N	0-5	calm		ND	clear	2.0
22 Jun	1815	D	21.0	20.0	14.5	S	0-5	S	0.3	ND	ovc.	2.5
22 Jun	2208	D	19.0	18.2	9.9	E	0-5	E	0.3	ND	clear	
21 Jun	1715	G	19.5	18.7	18.7	NW	0-5	var.	0.3	N	pc.	3.0
21 Jun	2250	G	18.5	18.2	15.2	var.	0-5	var.	0.2	ND	clear	
21 Jun	1805	H	19.2	17.5	10.5	NW	0-5	var.	0.3	ND	pc.	2.5
21 Jun	2155	H	18.1	18.0	10.0	NW	0-5	var.	0.3	ND	clear	
22 Jun	1639	R	18.5	17.0	12.0	SE	0-5	NW	0.3	S	ovc., rain	3.0
22 Jun	1921	R	20.0	ND	ND	S	10-15	S	0.6	ND	ovc.	5.0
22 Jun	2055	E	17.5	15.8	14.4	SE	0-5	S	0.6	ND	pc.	
21 Jun	1914	W	19.5	18.2	17.5	NW	5-10	NW	0.4	ND	clear	6.0
21 Jun	2040	W	19.4	19.3	18.5	NW	5-10	NW	0.3	ND	clear	
13 Jul	1530	A	20.3	ND	20.3	NW	0-5	NW	0.2-0.3	E	clear	0.2
13 Jul	2346	A	18.0	ND	18.0	E	5-10	E	0.2	SE	clear	
13 Jul	1455	B	20.5	ND	20.5	NW	0-5	NW	0.2-0.3	E	clear	0.2
13 Jul	2300	B	19.0	ND	19.0	E	5-10	E	0.2	SE	clear	
13 Jul	1630	F	22.0	ND	22.0	NW	0-5	NW	0.2-0.3	NE	clear	0.2
13 Jul	2210	F	21.0	ND	21.0	E	5-10	E	0.2	SE	clear	
15 Jul	1055	C	24.7	23.8	23.6	SW	5-10	W	0.2	ND	clear	1.7
13 Jul	2216	C	19.5	17.7	17.3	SE	0-5	NW	0.3	S	clear	
15 Jul	1227	D	24.4	23.6	22.5	SW	0-5	calm		ND	clear	1.7
13 Jul	2302	D	19.1	17.8	17.3	SE	0-5	NW	≤0.1	S	clear	
15 Jul	1325	G	25.1	24.1	23.5	SW	0-5	calm		ND	clear	1.8
14 Jul	0123	G	21.0	21.3	20.5	SE	10-15	SE	0.3	ND	clear	
15 Jul	1401	H	23.1	22.8	21.9	SW	0-5	SW	≤0.1	ND	ovc.	2.6
17 Jul*	2135	H	22.3	22.3	22.3	SW	5-10	W	0.2	ND	clear	
15 Jul	1015	R	23.6	23.6	22.4	SW	0-5	W	0.2	ND	clear	1.7
14 Jul	0003	R	18.8	17.9	17.1	SE	0-10	S	≤0.1	ND	clear	
15 Jul	2031	E	21.1	20.2	ND	S	0-5	SW	0.2	ND	pc.	3.0
17 Jul*	2330	E	21.6	21.0	ND	SW	5-10	W	0.3	ND	clear	
15 Jul	1941	W	21.8	20.9	ND	SW	5-10	SW	0.2	ND	pc.	4.3
17 Jul*	2235	W	21.6	21.5	21.2	SW	5-10	W	0.2	ND	clear	
30 Jul*	1400	N	25.0	24.0	24.0	SE	0-5	W	0.2	ND	clear	
17 Jul*	1837	4	22.6	22.5	ND	SE	0-5	W	0.3	ND	clear	2.0

Appendix 13. Continued.

Date	Start time (EST)	Station	Water temp (C) Surface	Mid-depth	Bottom	Wind Dir. from	Wind Speed (mph)	Waves Dir. from	Waves Ht. (m)	Current (Dir. from)	Weather	Secchi disc (m)
1976												
17 Jul*	1923	5	22.5	22.0	21.8	SE	0-5	W	0.3	ND	clear	2.0
17 Jul*	2004	6	22.2	22.0	21.5	SW	5-10	W	0.3	ND	clear	
9 Aug	1510	A	24.5	ND	24.5	W	0-5	calm		NE	clear	>1.0
10 Aug	2045	A	23.0	ND	23.0	E	0-5	E	0.2	E	clear	
9 Aug	1515	B	24.3	ND	24.1	W	0-5	calm		N	clear	>1.0
10 Aug	2130	B	22.0	ND	22.0	E	0-5	E	0.2	E	clear	
9 Aug	1620	F	24.0	ND	23.3	W	0-5	calm		N	clear	>1.0
10 Aug	2235	F	22.0	ND	22.0	E	0-5	E	0.2	N	clear	
10 Aug	1520	C	ND	22.4	22.2	S	0-5	S	0.3	ND	clear	3.6
10 Aug	2340	C	21.0	21.0	20.6	E	0-5	SW	0.3	ND	clear	
10 Aug	1430	D	22.5	22.2	22.2	S	0-5	SW	0.3	ND	clear	3.9
11 Aug	0020	D	21.5	21.5	21.4	E	0-5	S	0.3	ND	clear	
10 Aug	1646	G	22.2	21.4	21.2	SE	5-10	S	0.3	ND	clear	5.0
10 Aug	2034	G	21.6	21.5	21.4	SE	0-5	SW	0.4	ND	clear	
10 Aug	1730	H	22.0	21.7	21.8	SE	0-5	SW	0.3	ND	clear	4.0
10 Aug	2114	H	21.1	21.0	21.0	SE	0-5	SW	0.3-0.4	ND	clear	
10 Aug	1515	R	23.2	23.0	22.8	SE	5-10	SW	0.3	ND	clear	4.0
10 Aug	2232	R	21.8	22.2	ND	E	0-5	SW	0.3	ND	clear	
10 Aug	1010	E	21.5	20.8	15.4	S	10-15	S	0.3	ND	pc.	3.8
10 Aug	2110	E	21.5	20.8	15.4	N	5-10	S	≤0.1	ND	ND	
10 Aug	1647	W	21.5	19.5	15.9	S	10-15	S	0.6	ND	clear	4.6
10 Aug	2035	W	21.5	19.5	15.9	S	5-10	S	0.3	ND	clear	
8 Aug*	0806	N	21.5	ND	21.0	SW	10-15	SW	0.6	ND	clear	4.0
10 Aug*	1606	N	22.5	ND	22.0	SE	5-10	SW	0.3-0.4	ND	clear	3.0
10 Aug*	2319	N	21.2	21.2	21.2	E	0-5	SW	0.3	ND	clear	
10 Aug*	1347	4	24.0	23.0	21.0	S	10-15	S	0.4	ND	clear	3.6
11 Aug*	0113	4	21.0	21.0	21.0	SE	5-10	S	0.3	ND	clear	
10 Aug*	1147	5	21.8	20.2	18.5	S	10-15	SW	0.3	ND	clear	3.8
11 Aug*	0205	5	21.1	21.1	ND	SE	5-10	S	0.6	ND	clear	
10 Aug*	1056	6	21.3	19.2	16.7	E	10-15	SE	0.3	ND	ND	3.9
10 Aug*	2151	6	21.3	19.2	16.7	N	5-10	S	0.3	ND	ND	
13 Sep	1530	A	ND	ND	22.0	SW	0-5	SW	0.3	SW	clear	0.8
14 Sep	0045	A	ND	ND	20.0	SW	10-15	SW	0.6-0.9	S	clear	
13 Sep*	1535	A#	ND	ND	22.0	SW	0-5	SW	0.3	SW	clear	0.8
14 Sep*	0045	A#	ND	ND	20.0	SW	10-15	SW	0.6-0.9	S	clear	
13 Sep	1630	B	ND	ND	22.0	SW	0-5	SW	0.3	S	clear	0.8
14 Sep	0143	B	ND	ND	19.9	SW	10-15	SW	0.6-0.9	S	clear	
13 Sep*	1645	B#	ND	ND	22.0	SW	0-5	SW	0.3	SW	clear	0.8
14 Sep*	0143	B#	ND	ND	19.9	SW	10-15	SW	0.6-0.9	S	clear	
13 Sep	1800	F	ND	ND	21.7	SW	0-5	SW	0.3	SW	clear	0.8
14 Sep	0345	F	ND	ND	19.5	SW	10-15	SW	0.6-0.9	S	clear	
13 Sep*	1800	F#	ND	ND	19.5	SW	0-5	SW	0.3	SW	clear	0.8
14 Sep*	0345	F#	ND	ND	19.5	SW	10-15	SW	0.6-0.9	S	clear	
14 Sep	1447	C	22.0	20.2	20.0	SW	0-5	SW	0.3	N	pc.	2.8
14 Sep	2345	C	20.2	ND	19.6	NW	15-20	NW	0.3-0.6	ND	ovc.	

Appendix 13. Continued.

			Water temp (C)			Wind		Waves		Cur-rent		Sec-chi
Date	Start time (EST)	Sta-tion	Sur-face	Mid-depth	Bot-tom	Dir. from	Speed (mph)	Dir. from	Ht. (m)	(Dir. from)	Weather	disc (m)
1976												
14 Sep*	1535	C#	ND	ND	18.0	ND	ND	ND	ND	ND	pc.	2.8
14 Sep*	2215	C#	20.5	ND	19.7	SW	0-5	SW	0.2	ND	clear	
14 Sep	1538	D	21.5	19.8	19.8	SW	0-5	SW	0.3	N	pc.	3.8
14 Sep	2112	D	19.5	19.0	18.5	NE	0-5	SW	0.2	S	ovc.	
14 Sep*	1547	D#	18.0	ND	18.0	ND	ND	ND	ND	ND	pc.	3.8
14 Sep*	2200	D#	20.2	ND	19.6	SW	0-5	SW	0.2	ND	clear	
14 Sep	1636	G	21.5	21.0	20.5	SW	0-5	SW	0.3	S	pc.	3.2
14 Sep	2000	G	20.5	19.5	19.5	var.	0-5	SW	0.2	S	ovc., rain	
14 Sep	1720	H	21.0	19.8	19.5	N	0-5	SW	0.3	S	ovc., rain	3.0
14 Sep	1908	H	20.5	20.0	18.5	N	5-10	SW	0.3	S	ovc.	
14 Sep	1405	R	20.5	20.2	20.2	SW	0-5	SW	0.3-0.6	N	clear	2.0
29 Sep	2145	R	20.0	20.0	18.9	SE	0-5	SW	0.3	S	clear	
14 Sep*	1522	N#	22.1	ND	21.2	ND	ND	ND	ND	ND	pc.	ND
14 Sep*	2240	N#	18.0	ND	ND	SW	0-5	SW	0.2	ND	calm	
14 Sep*	1602	P#	22.0	ND	21.5	ND	ND	ND	ND	ND	pc.	ND
14 Sep*	2300	P#	18.0	ND	ND	SW	0-5	SW	0.2	ND	calm	
11 Oct	1510	A	16.3	ND	16.3	S	5-10	SW	0.2-0.3	S	clear	>1.0
12 Oct	0035	A	13.9	ND	13.5	SW	5-10	SW	0.3-0.4	S	pc.	
11 Oct*	1515	A#	16.3	ND	16.3	S	5-10	SW	0.2-0.3	S	clear	>1.0
12 Oct*	0035	A#	13.9	ND	13.5	SW	5-10	SW	0.3-0.4	S	pc.	
11 Oct	1555	B	15.5	ND	15.5	S	5-10	SW	0.2-0.3	SE	clear	>1.5
12 Oct	0105	B	13.5	ND	13.5	SW	5-10	SW	0.3-0.4	S	pc.	
11 Oct*	1555	B#	15.5	ND	15.5	S	5-10	SW	0.2-0.3	SE	clear	1.0
12 Oct*	0105	B#	13.5	ND	13.5	SW	5-10	SW	0.3-0.4	S	pc.	
11 Oct	1655	F	15.0	ND	15.0	S	5-10	SW	0.2-0.3	SE	clear	0.5
11 Oct	2330	F	14.0	ND	14.0	SW	5-10	SW	0.3-0.4	S	pc.	
11 Oct*	1655	F#	15.0	ND	15.0	S	5-10	SW	0.2-0.3	SE	clear	0.5
11 Oct*	2330	F#	14.0	ND	14.0	SW	5-10	SW	0.3-0.4	S	pc.	
19 Oct*	1645	C	13.3	13.0	12.5	E	0-5	E	≤0.1	E	ovc., rain	ND
19 Oct*	2145	C	13.2	13.0	12.9	E	0-5	E	0.2	ND	ovc., fog	
12 Oct*	2100	C#	16.2	ND	15.9	SW	10-15	SW	0.3	ND	pc.	
19 Oct*	1735	D	13.1	12.8	12.5	E	0-5	E	0.2	E	ovc., rain	2.0
19 Oct*	2050	D	13.1	12.7	12.3	E	0-5	E	0.2	ND	ovc., fog	
12 Oct*	2045	D#	17.4	ND	16.3	SW	10-15	SW	0.3	ND	pc.	
19 Oct*	1855	G	13.4	13.0	12.9	E	0-5	E	0.2	ND	ovc., rain	
19 Oct*	1940	H	13.3	13.2	13.0	SE	0-5	E	0.2	ND	ovc., rain	
19 Oct*	1555	R	14.5	14.1	13.8	E	0-5	E	≤0.1	E	ovc., rain	1.9
19 Oct*	2240	R	14.3	13.5	12.3	E	0-5	E	0.2	ND	ovc., fog	
12 Oct*	2130	N#	15.8	ND	15.8	SW	10-15	SW	0.3	ND	pc.	
12 Oct*	2140	P#	16.0	ND	16.0	SW	10-15	SW	0.3	ND	pc.	
8 Nov	1635	A	ND	ND	6.0	SE	0-5	NW	0.6-0.9	N	clear	0.5
8 Nov	2008	A	ND	ND	5.0	S	0-5	W	0.6-0.9	S	pc.	
8 Nov	1650	B	ND	ND	6.5	SE	0-5	NW	0.6-0.9	N	clear	ND
8 Nov	2030	B	ND	ND	5.0	S	5-10	SE	0.6-0.9	N	ND	
8 Nov	1730	F	ND	ND	5.5	S	0-5	NW	0.6-0.9	N	pc.	0.5
8 Nov	1750	F	ND	ND	5.5	S	0-5	NW	0.6-0.9	N	pc.	

Appendix 13. Continued.

Date	Start time (EST)	Station	Water temp (C) Surface	Mid-depth	Bottom	Wind Dir. from	Speed (mph)	Waves Dir. from	Ht. (m)	Current (Dir. from)	Weather	Secchi disc (m)
1977												
11 Apr	1540	A	13.8	ND	13.5	SW	5-10	SW	≤0.1	S	clear	0.8
11 Apr	2305	A	11.2	ND	10.8	SW	5-10	W	0.4	N	clear	
11 Apr	1610	B	13.5	ND	13.5	SW	5-10	SW	≤0.1	S	clear	0.8
11 Apr	2338	B	10.5	ND	10.5	SW	5-10	W	0.4	N	clear	
11 Apr	1735	F	12.2	ND	12.2	SW	5-10	SW	≤0.1	S	clear	0.8
11 Apr	2358	F	10.8	ND	10.8	SW	5-10	W	0.4	N	clear	
17 Apr	1530	C	12.7	10.9	10.7	calm		calm		ND	clear	4.0
17 Apr	2150	C	10.8	9.8	9.6	SE	10-15	SW	0.2	ND	clear	
17 Apr	1609	D	12.2	9.6	9.3	calm		calm		ND	clear	4.3
17 Apr	2105	D	10.9	10.4	9.4	SE	5-10	calm		ND	clear	
17 Apr	1754	G	13.2	10.6	9.8	calm		calm		ND	clear	3.8
17 Apr	1927	G	12.5	10.0	10.0	calm		calm		ND	clear	
17 Apr	1712	H	11.6	10.2	9.6	calm		calm		ND	clear	3.6
17 Apr	2001	H	13.8	9.8	8.8	S	0-5	calm		ND	clear	
17 Apr	1454	R	11.6	10.8	10.6	calm		calm		ND	clear	3.3
17 Apr	2232	R	10.6	10.6	10.2	SE	10-15	SW	0.2	ND	clear	
17 May	1200	A	17.0	ND	16.5	S	0-5	calm		SE	clear	>1.0
17 May	2203	A	17.5	ND	17.9	S	0-10	SW	0.2	S	pc.	
17 May	1230	B	16.8	ND	16.2	S	0-5	calm		SW	clear	>1.0
17 May	2214	B	17.5	ND	17.1	S	0-10	calm		S	pc.	
17 May	1325	F	18.1	ND	18.1	S	0-5	calm		S	clear	>1.0
17 May	2230	F	17.0	ND	17.0	S	0-10	calm		E	pc.	
18 May	1540	C	19.0	16.0	16.0	calm		calm		N	clear	>1.0
19 May	2336	C	17.8	15.4	15.0	S	0-5	calm		ND	clear	
19 May	1000	D	18.7	17.7	16.7	SW	0-5	SW	≤0.1	ND	clear	4.0
19 May	1116	G	17.2	17.7	19.5	SW	5-10	SW	0.2	ND	clear	5.5
19 May	1155	H	20.0	18.0	18.0	SW	0-5	SW	≤0.1	ND	clear	5.5
18 May	1530	R	18.5	17.0	17.0	calm		calm		N	clear	>1.0
19 May	2249	R	16.8	15.7	15.2	E	5-10	calm		ND	clear	
17 May	1933	E	13.0	11.0	10.5	SW	5-10	SW	0.2-0.3	ND	pc.	7.0
17 May	2133	E	12.0	11.5	10.5	var.	0-5	SW	0.2-0.3	ND	pc.	
19 May	1316	W	16.5	15.2	13.2	SW	0-5	calm		ND	clear	6.0
19 May	2033	W	13.5	12.0	11.0	var.	0-5	SW	0.2	ND	pc.	
13 Jun	1605	A	15.4	ND	15.4	N	5-10	NW	0.2	N	pc.	ND
13 Jun	2340	A	ND	ND	14.2	NE	0-5	NW	0.3	N	pc.	
13 Jun	1535	B	15.4	ND	15.6	N	5-10	NW	0.2	N	pc.	ND
13 Jun	2310	B	ND	ND	14.5	NE	0-5	NW	0.3	N	pc.	
13 Jun	1700	F	15.5	ND	15.5	N	5-10	NW	0.2	N	pc.	ND
14 Jun	0040	F	ND	ND	14.2	NE	0-5	NW	0.3	N	pc.	
16 Jun	1840	C	18.5	16.5	16.2	calm		calm		ND	clear	5.0
16 Jun	0137	C	15.0	15.0	14.5	calm		calm		N	clear	
15 Jun	1620	D	16.0	15.0	14.5	NW	5-10	NW	0.3	N	clear	4.5
16 Jun	0040	D	15.0	14.7	14.5	SE	0-5	NW	≤0.1	N	clear	
15 Jun	1900	G	16.5	16.0	15.8	NW	0-5	NW	0.3	N	clear	4.5
15 Jun	2332	G	16.0	15.5	15.5	N	5-10	calm		N	clear	

Appendix 13. Continued.

Date	Start time (EST)	Station	Water temp (C) Surface	Mid-depth	Bottom	Wind Dir. from	Speed (mph)	Waves Dir. from	Ht. (m)	Current (Dir. from)	Weather	Secchi disc (m)
1977												
16 Jun	1958	H	8.5	17.5	17.0	calm		calm		ND	clear	6.5
15 Jun	2234	H	16.0	15.0	15.0	SE	0-5	SE	0.2	N	clear	
15 Jun	1536	R	17.0	15.5	14.5	NW	5-10	NW	0.3	N	clear	4.5
16 Jun	0225	R	16.0	15.2	14.2	calm		calm		N	clear	
14 Jun	1700	E	15.8	15.1	12.1	ND	ND	ND	ND	ND	ND	6.0
15 Jun	2107	E	15.5	15.5	15.5	NW	0-5	NW	0.2	N	clear	
14 Jun	1617	W	15.2	15.1	12.1	ND	ND	ND	ND	ND	ND	6.0
15 Jun	2002	W	16.5	14.5	14.0	NW	0-5	NW	0.2	N	clear	
12 Jul	1320	A	22.0	ND	22.3	SW	5-10	W	0.4	S	pc.	1.3
12 Jul	2225	A	22.5	ND	22.5	S	5-10	calm		S	clear	
12 Jul	1235	B	20.3	ND	20.5	SW	5-10	W	0.4	S	pc.	1.3
12 Jul	2200	B	23.0	ND	23.0	S	5-10	calm		S	clear	
12 Jul	1430	F	23.1	ND	23.0	SW	5-10	W	0.4	S	pc.	1.3
12 Jul	2325	F	20.0	ND	20.0	S	5-10	calm		S	clear	
12 Jul	1329	C	21.7	21.0	21.0	var.	0-5	SW	0.6	ND	clear	4.5
27 Jul	2030	C	ND	ND	ND	N	0-5	calm		ND	clear	
12 Jul	1404	D	22.3	20.2	19.2	var.	0-5	S	0.3-0.6	ND	pc.	4.6
27 Jul	2115	D	ND	ND	ND	N	0-5	calm		ND	clear	
12 Jul	1505	G	21.9	21.2	21.3	var.	0-5	S	0.3	ND	clear	6.0
27 Jul	2230	G	ND	ND	ND	N	0-5	calm		ND	clear	
12 Jul	1537	H	21.8	20.3	17.4	SE	5-10	S	0.3-0.6	ND	clear	6.8
27 Jul	2305	H	ND	ND	ND	N	0-5	calm		ND	clear	
12 Jul	1244	R	20.7	20.3	20.3	SE	0-5	SW	0.3	ND	pc.	5.2
27 Jul	1955	R	ND	ND	ND	N	0-5	calm		ND	clear	
12 Jul	1726	E	21.0	19.7	16.4	S	5-10	S	0.2	ND	clear	7.7
28 Jul	0110	E	ND	ND	ND	SE	0-5	SW	≤0.1	ND	ND	
12 Jul	1633	W	21.3	19.8	12.7	SE	5-10	S	0.3-0.6	ND	clear	7.5
28 Jul	0010	W	ND	ND	ND	E	0-5	calm		ND	clear	
9 Aug	1520	A	23.2	ND	23.2	SE	10-15	S	≤0.1	ND	ovc.	>1.0
10 Aug	2310	A	23.2	ND	23.2	E	0-5	calm		ND	clear	
9 Aug	1555	B	23.0	ND	23.0	SE	10-15	S	≤0.1	ND	ovc.	>1.0
10 Aug	2235	B	23.3	ND	23.0	E	0-5	calm		0	clear	
9 Aug	1735	F	22.5	ND	22.5	SE	10-15	S	≤0.1	ND	ovc.	>1.0
10 Aug	2144	F	24.3	ND	23.7	E	0-5	calm		N	clear	
9 Aug	1751	C	ND	ND	ND	E	5-10	SE	0.2	E	ovc., rain	ND
10 Aug	2117	C	23.2	21.9	21.5	S	0-5	calm		ND	clear	
9 Aug	1714	D	21.5	ND	ND	SE	0-5	SE	0.2	ND	ovc.	5.8
10 Aug	2154	D	22.5	22.0	21.5	SE	0-5	SE	≤0.1	ND	clear	
9 Aug	1217	G	22.2	21.8	21.8	S	10-15	SE	0.3	ND	ovc.	ND
10 Aug	2252	G	24.0	ND	ND	S	0-5	calm		ND	clear	
9 Aug	1139	H	ND	ND	ND	SE	5-10	SE	0.2	ND	ovc.	4.8
10 Aug	2333	H	23.5	22.5	22.0	SE	0-5	SE	≤0.1	ND	clear	
9 Aug	1641	R	ND	ND	ND	ND	ND	calm		E	ovc.	ND
10 Aug	2033	R	23.8	ND	ND	SE	0-5	calm		ND	clear	
9 Aug	1409	E	21.2	9.0	8.3	SE	5-10	SE	0.2	ND	ovc., rain	7.0

Appendix 13. Continued.

Date	Start time (EST)	Station	Water temp (C) Surface	Mid-depth	Bottom	Wind Dir. from	Speed (mph)	Waves Dir. from	Ht. (m)	Current (Dir. from)	Weather	Secchi disc (m)
1977												
11 Aug	0127	E	22.5	21.5	19.5	W	0-5	W	0.2	ND	clear	
9 Aug	1331	W	21.9	8.2	7.9	S	5-10	SE	0.2	E	ovc.	7.0
11 Aug	0028	W	23.2	22.0	14.9	SW	0-5	calm		ND	clear	
12 Sep	1515	A	18.5	18.5	18.5	SE	10-15	S	0.9	S	ovc., rain	1.5
12 Sep	2135	A	18.0	ND	18.5	SE	5-10	SE	0.2	ND	ovc., rain	
12 Sep	1440	B	18.3	18.3	18.3	SE	10-15	S	0.9	S	ovc., rain	1.5
12 Sep	2105	B	18.0	ND	17.9	SE	5-10	SE	0.2	ND	ovc., rain	
12 Sep	1610	F	19.0	19.0	19.0	SE	10-15	S	0.9	S	ovc., rain	1.5
12 Sep	2240	F	18.4	ND	18.1	SE	5-10	SE	0.2	ND	ovc., rain	
13 Sep	1400	C	19.5	19.5	19.5	NE	10-15	N	0.3	ND	ovc., rain	2.5
15 Sep	2004	C	10.0	10.0	10.0	E	15-20	E	0.2	ND	ovc., rain	
13 Sep	1323	D	19.2	19.2	19.0	NE	10-15	N	0.3	ND	ovc., rain	3.0
15 Sep	2045	D	10.0	10.0	10.0	E	15-20	E	0.3	ND	ovc.	
13 Sep	1521	G	19.5	19.5	19.9	N	10-15	N	0.6	ND	ovc., rain	3.0
15 Sep	2151	G	9.5	9.0	9.0	E	15-20	E	0.3	ND	ovc.	
13 Sep	1446	H	19.5	19.5	20.0	NE	5-10	N	0.4	ND	ovc., rain	2.5
15 Sep	2226	H	9.5	9.5	9.5	E	15-20	E	0.3	ND	ovc.	
13 Sep	1250	R	20.0	20.0	19.5	N	10-15	N	0.3	ND	ovc., rain	3.0
15 Sep	1923	R	10.0	10.0	10.0	E	15-20	E	0.3	ND	ovc., rain	
13 Sep	1702	E	19.0	19.0	19.0	NE	10-15	NE	0.6-0.9	ND	ovc.	2.5
13 Sep	1610	W	19.1	18.8	13.0	NE	10-15	N	0.6	ND	ovc.	3.5
10 Oct	1600	A	13.9	ND	13.9	SE	10-15	SW	0.6	S	pc.	>1.0
10 Oct	2325	A	11.7	ND	11.7	SE	15-20	SW	0.6	S	ovc.	
10 Oct	1530	B	13.0	ND	13.0	SW	10-15	SW	0.6	S	pc.	>1.0
10 Oct	2250	B	12.7	ND	12.7	SE	15-20	W	0.6	S	ovc.	
10 Oct	1655	F	13.3	ND	13.3	SW	10-15	SW	0.6	S	pc.	>1.0
10 Oct	2155	F	12.5	ND	12.5	SE	15-20	SE	0.6	S	ovc.	
8 Nov	1414	A	11.8	ND	11.8	calm		calm		E	ovc., fog	>1.0
8 Nov	2150	A	11.7	ND	11.7	calm		calm		NC	ovc.	
8 Nov	1337	B	11.4	ND	11.2	calm		calm		E	ovc., fog	>1.0
8 Nov	2120	B	11.3	ND	11.4	calm		calm		ND	ovc.	
8 Nov	1527	F	11.9	ND	11.7	N	0-5	W	0.2	S	ovc., fog	>1.0
8 Nov	2014	F	7.9	ND	7.9	calm		calm		ND	ovc.	
1978												
11 Apr	1153	C	3.9	3.9	3.9	SW	10-15	SW	0.6-0.9	S	pc.	2.0
27 Apr	2054	C	9.5	6.0	6.0	NE	0-5	NE	0.2	ND	clear	
11 Apr	1250	D	3.5	3.5	3.5	SW	10-15	SW	0.9	ND	pc.	2.8
27 Apr	2120	D	8.0	7.0	6.0	NE	0-5	NE	0.2	ND	clear	
11 Apr	1545	G	4.3	4.3	4.3	SW	15-20	S	0.9	ND	ovc.	1.5
27 Apr	2208	G	9.0	6.5	6.5	NE	0-5	NE	0.2	ND	clear	
11 Apr	1511	H	4.1	4.1	4.1	SW	15-20	S	0.9	ND	ovc.	1.6
27 Apr	2232	H	9.0	6.5	6.5	NE	0-5	NE	0.2	ND	clear	
11 Apr	1110	R	3.2	3.2	3.2	SW	10-15	SW	0.6	ND	pc.	2.8
27 Apr	2026	R	9.5	7.0	7.0	NE	0-5	NE	0.2	ND	clear	
11 Apr	1338	E	1.9	1.6	1.6	SW	10-15	SW	0.6-0.9	ND	pc.	2.8
27 Apr	2355	E	6.0	5.0	5.0	NE	0-5	NE	0.2	ND	clear	
11 Apr	1425	W	2.0	1.8	1.8	SW	10-15	SW	0.6-0.9	ND	ovc.	3.0

Appendix 13. Continued.

Date	Start time (EST)	Sta-tion	Water temp (C) Sur-face	Mid-depth	Bot-tom	Wind Dir. from	Speed (mph)	Waves Dir. from	Ht. (m)	Cur-rent (Dir. from)	Weather	Sec-chi disc (m)
1978												
27 Apr	2314	W	6.0	5.5	5.5	NE	0-5	NE	0.2	ND	clear	
10 Apr	1815	A	6.5	6.5	6.5	NW	15-20	SW	0.9	S	ovc., rain	>1.0
12 Apr	2250	A	5.6	5.6	5.6	SW	10-15	SW	0.9	S	clear	
10 Apr	1735	B	7.0	7.0	7.0	NW	15-20	SW	0.9	S	ovc., rain	>1.0
12 Apr	2217	B	5.5	5.5	6.0	SW	10-15	SW	0.9	S	clear	
10 Apr	1917	F	5.0	5.0	5.0	NW	15-20	SW	0.9	S	ovc., rain	>1.0
11 Apr	2122	F	6.0	6.0	6.0	SW	10-15	SW	0.9	S	clear	
10 May	1411	C	10.1	9.5	8.5	calm		calm		ND	clear	1.7
10 May	2300	C	8.5	8.5	7.7	SE	5-10	NE	0.2	ND	clear	
10 May	1336	D	8.1	8.1	8.1	var.	0-5	calm		ND	clear	2.0
10 May	2325	D	10.5	10.0	7.5	SE	10-15	NE	0.3	ND	clear	
10 May	1620	G	10.4	9.5	9.4	N	0-5	calm		ND	pc.	ND
25 May	2042	G	ND	ND	ND	calm		calm		ND	clear	
10 May	1546	H	10.5	8.6	8.6	N	5-10	calm		ND	pc.	1.9
25 May	2122	H	13.5	12.0	9.0	calm		calm		ND	clear	
10 May	1150	R	9.7	9.2	8.3	NW	5-10	var.	0.3	S	clear	1.5
10 May	2222	R	9.0	8.5	7.10	SE	5-10	NE	0.2	ND	clear	
10 May	1255	E	7.2	6.7	6.6	calm		var.	0.2	ND	clear	2.7
25 May	2314	E	14.0	9.5	6.0	calm		calm		ND	clear	
10 May	1500	W	8.8	6.5	6.0	N	0-5	calm		ND	pc.	2.0
25 May	2222	W	14.0	12.0	6.0	calm		calm		ND	clear	
8 May	1658	A	11.9	ND	12.0	SE	0-5	SW	0.2	S	clear	1.5
8 May	2345	A	10.0	ND	10.0	S	5-10	SW	0.6	S	clear	
8 May	1606	B	10.5	ND	10.0	SE	0-5	SW	0.2	S	clear	1.5
8 May	2316	B	10.0	ND	10.0	S	5-10	SW	0.6	S	clear	
8 May	1510	F	10.5	ND	10.0	SE	0-5	SW	0.2	S	clear	1.5
8 May	2205	F	10.8	ND	10.8	S	5-10	SW	0.6	S	clear	
14 Jun	1500	C	6.8	5.8	6.0	NW	5-10	SW	0.2	SE	ovc.	2.0
22 Jun	2135	C	16.0	16.5	16.0	SE	0-5	var.	0.2	ND	clear	
14 Jun	1420	D	6.3	5.8	5.3	N	5-10	NW	0.3	SE	ovc.	1.6
22 Jun	2210	D	16.5	15.0	11.0	SE	0-5	var.	0.2	ND	clear	
14 Jun	1551	G	13.0	9.0	9.0	N	0-5	NW	0.3	SE	ovc.	2.0
22 Jun	2313	G	17.0	16.5	13.5	SW	0-5	var.	0.2	ND	clear	
14 Jun	1620	H	13.0	9.0	8.0	N	0-5	NW	0.3	SE	ovc.	2.0
22 Jun	2349	H	17.0	15.5	11.5	SW	0-5	calm		ND	clear	
14 Jun	1340	R	6.0	6.2	6.8	NW	5-10	SW	0.2	SE	ovc.	1.6
22 Jun	2055	R	17.5	15.5	14.0	E	0-5	var.	0.2	ND	clear	
14 Jun	1255	E	12.0	5.0	4.5	W	0-5	calm		SE	ovc.	2.0
23 Jun	0137	E	16.5	12.5	11.5	S	0-5	calm		ND	clear	
14 Jun	1726	W	14.0	14.0	11.0	N	5-10	NW	0.3	SE	ovc.	4.0
23 Jun	0044	W	16.5	15.0	10.0	S	0-5	calm		ND	clear	
14 Jun	1630	A	10.0	ND	9.0	NW	0-5	NW	0.2	N	ovc.	0.6
13 Jun	2307	A	14.0	ND	14.5	NW	10-15	NW	0.6	N	clear	
14 Jun	1555	B	9.5	ND	9.5	NW	0-5	NW	0.2	N	ovc.	>1.0
13 Jun	2230	B	15.7	ND	15.7	NW	10-15	NW	0.6	N	clear	
14 Jun	1505	F	12.0	ND	11.7	NW	0-5	NW	0.2	N	ovc.	>1.0
15 Jun	2116	F	15.5	ND	16.0	NW	10-15	NW	0.6	N	clear	

Appendix 13. Continued.

Date	Start time (EST)	Station	Water temp (C) Surface	Water temp (C) Mid-depth	Water temp (C) Bottom	Wind Dir. from	Wind Speed (mph)	Waves Dir. from	Waves Ht. (m)	Current (Dir. from)	Weather	Secchi disc (m)
1978												
11 Jul	1404	C	8.0	8.0	8.0	var.	0-5	NW	0.3	ND	clear	2.5
11 Jul	2230	C	11.0	9.0	6.5	SE	0-5	E	0.2	ND	clear	
11 Jul	1434	D	9.0	6.8	6.0	var.	0-5	NW	0.3	ND	clear	2.8
11 Jul	2259	D	9.5	8.0	6.0	E	0-5	E	0.2	ND	clear	
11 Jul	1528	G	9.9	7.8	8.0	var.	0-5	calm		ND	clear	2.9
11 Jul	2351	G	8.5	7.0	6.5	SE	0-5	E	0.2	ND	clear	
11 Jul	1556	H	8.5	7.0	7.0	var.	0-5	calm		ND	clear	3.0
12 Jul	0019	H	9.0	7.5	6.0	SE	5-10	E	0.2	ND	clear	
11 Jul	1332	R	12.0	8.0	7.0	var.	0-5	NW	0.3	ND	clear	2.0
11 Jul	2156	R	11.8	9.8	6.0	N	0-5	E	0.2	ND	clear	
11 Jul	1207	E	12.0	7.0	6.0	var.	0-5	N	0.3	ND	clear	1.5
12 Jul	0154	E	11.5	9.0	5.3	E	5-10	E	0.2	ND	clear	
11 Jul	1647	W	14.0	10.0	5.5	W	0-5	NW	0.2	ND	clear	3.5
12 Jul	0108	W	13.5	6.0	5.0	E	5-10	E	0.2	ND	clear	
10 Jul	1410	A	14.0	ND	14.0	N	15-20	NW	0.6	N	clear	0.5
11 Jul	0022	A	10.5	ND	10.5	var.	5-10	W	0.3	N	clear	
10 Jul	1750	B	14.0	ND	14.0	N	15-20	NW	0.6	N	clear	0.5
10 Jul	2343	B	10.5	ND	10.5	var.	5-10	W	0.3	N	clear	
10 Jul	1610	F	14.2	14.2	14.2	N	15-20	NW	0.6	N	clear	0.5
10 Jul	2232	F	9.0	ND	9.0	var.	5-10	W	0.3	N	clear	
9 Aug	1340	C	21.8	21.8	22.0	NW	0-5	SW	0.6	S	clear	4.5
29 Aug	2312	C	23.5	23.5	22.5	S	0-5	W	0.3	ND	pc.	
9 Aug	1300	D	22.0	21.8	21.8	NW	0-5	SW	0.6	S	clear	4.0
29 Aug	2349	D	23.0	22.5	22.0	S	0-5	SW	0.2-0.3	ND	pc.	
9 Aug	1426	G	22.2	22.0	22.2	NW	0-5	SW	0.6	S	clear	4.5
30 Aug	0053	G	23.0	22.5	22.0	SE	5-10	SW	0.2-0.3	ND	pc.	
9 Aug	1455	H	21.8	21.8	21.8	NW	0-5	SW	0.6	S	clear	5.5
30 Aug	0127	H	22.5	22.5	22.5	SE	5-10	SW	0.2-0.3	ND	pc.	
9 Aug	1220	R	22.8	21.8	21.8	SW	0-5	SW	0.6	S	pc.	3.5
29 Aug	2236	R	24.0	24.0	23.0	S	0-5	NW	0.2-0.3	ND	pc.	
9 Aug	1640	E	21.5	18.8	7.5	N	5-10	var.	0.3	S	clear	4.5
30 Aug	0318	E	22.0	20.5	17.0	S	0-5	SW	0.2-0.3	ND	pc.	
9 Aug	1553	W	21.8	18.0	7.5	N	5-10	var.	0.3	S	clear	6.0
30 Aug	0227	W	22.5	22.4	22.0	S	0-5	SW	0.2-0.3	ND	pc.	
9 Aug	1632	A	25.2	ND	2.52	SW	0-5	S	0.3	S	clear	0.8
9 Aug	0008	A	21.5	21.5	21.5	S	10-15	SW	0.6	S	clear	
9 Aug	1603	B	22.0	ND	21.5	SW	0-5	S	0.3	S	clear	0.8
8 Aug	2342	B	21.5	21.5	21.5	S	10-15	SW	0.6	S	clear	
9 Aug	1505	F	23.0	ND	22.5	SW	0-5	S	0.3	S	clear	0.8
8 Aug	2245	F	21.0	21.0	21.0	S	10-15	SW	0.6	S	clear	
12 Sep	1412	C	26.9	26.1	24.2	SE	5-10	SW	0.2	ND	ovc.	2.5
12 Sep	1332	C	29.1	28.0	17.5	E	10-15	SW	0.2	ND	ovc.	3.5
28 Sep	2202	D	17.0	17.0	16.5	NE	0-5	N	0.3-0.6	ND	pc.	
12 Sep	1459	G	26.0	26.0	26.0	NE	5-10	SW	0.3	ND	pc.	3.0
28 Sep	2030	G	16.5	16.5	16.5	NE	0-5	NE	0.3-0.6	ND	pc.	

Appendix 13. Continued.

Date	Start time (EST)	Station	Water temp (C) Surface	Mid-depth	Bottom	Wind Dir. from	Speed (mph)	Waves Dir. from	Ht. (m)	Current (Dir. from)	Weather	Secchi disc (m)
1978												
12 Sep	1529	H	24.8	24.4	19.0	NE	5-10	S	0.3	ND	pc.	3.5
28 Sep	2105	H	16.5	16.5	16.0	NE	0-5	NE	0.3-0.6	ND	pc.	
12 Sep	1216	R	24.0	23.8	23.5	SE	0-5	SW	0.3	ND	ovc., rain	2.0
12 Sep	1721	E	23.3	19.8	9.1	NE	20-25	NE	1.2-1.5	ND	ovc.	3.0
12 Sep	1622	W	24.0	20.1	9.9	NE	20-25	NE	0.9	ND	ND	3.5
11 Sep	1615	A	28.5	28.2	28.2	S	0-5	SW	0.2	S	clear	>1.0
11 Sep	2147	A	27.0	27.0	27.0	SE	5-10	SW	0.2	S	clear	
11 Sep	1540	B	26.3	26.3	26.3	S	0-5	SW	0.2	S	clear	>1.0
11 Sep	2118	B	25.0	ND	25.5	SE	5-10	SW	0.2	S	clear	
11 Sep	1445	F	25.5	25.5	25.5	S	0-5	SW	0.2	S	clear	>1.0
11 Sep	2020	F	25.6	25.6	25.6	SE	5-10	SW	0.2	S	clear	
9 Oct	1725	A	14.4	ND	14.7	S	15-20	SW	0.9	S	pc.	0.8
9 Oct	2225	A	14.0	14.0	14.0	S	15-20	SW	0.9	S	clear	
9 Oct	1445	B	14.4	14.4	14.4	S	15-20	SW	0.9	S	pc.	0.8
9 Oct	2200	B	13.5	13.5	13.5	S	15-20	SW	0.9	S	clear	
9 Oct	1545	F	14.5	ND	14.2	S	15-20	SW	0.9	S	pc.	0.8
9 Oct	2105	F	13.8	ND	13.5	S	15-20	SW	0.9	S	clear	
16 Nov	1610	A	9.6	9.6	9.6	NE	5-10	var.	0.2	NW	ovc.	>1.0
16 Nov	0020	A	10.0	10.0	10.0	calm		NW	0.3	ND	ovc.	
16 Nov	1550	B	9.0	9.0	9.0	NE	5-10	var.	0.2	NW	ovc.	>1.0
15 Nov	2355	B	9.0	9.0	9.0	calm		NW	0.3	ND	ovc.	
16 Nov	1507	F	8.5	8.5	8.5	NE	5-10	var.	0.2	NW	ovc.	>1.0
15 Nov	2300	F	8.5	8.5	8.5	calm		NW	0.3	ND	ovc.	

Appendix 13. Continued.

Date	Start time (EST)	Station	Water temp (C) Surface	Mid-depth	Bottom	Wind Dir. from	Speed (mph)	Waves Dir. from	Ht. (m)	Current (Dir. from)	Weather	Secchi disc (m)
1979												
10 Apr	1038	C	4.0	4.0	4.0	N	5-10	NW	0.6	ND	ND	0.5
19 Apr	2132	C	6.5	6.5	5.5	NE	5-10	NE	0.2	ND	clear	
10 Apr	0944	D	2.5	2.5	2.8	calm		NW	0.6	ND	clear	0.8
19 Apr	2210	D	5.5	6.0	6.5	SE	5-10	E	0.2	ND	clear	
10 Apr	1300	G	3.0	3.0	3.0	NE	5-10	N	0.6	ND	pc.	0.4
11 Apr	0119	G	2.5	2.5	2.5	E	5-10	N	0.3	SE	clear	
10 Apr	1348	H	2.5	2.5	2.5	NE	10-15	N	0.6	ND	ovc.	0.5
11 Apr	0215	H	2.5	2.5	2.5	SE	5-10	N	0.3-0.6	SE	pc.	
10 Apr	0903	R	3.0	3.0	3.0	S	0-5	NW	0.3	ND	ND	0.5
19 Apr	2020	R	6.5	6.5	6.0	NE	5-10	NE	0.2	ND	clear	
10 Apr	1138	E	2.5	2.0	2.0	N	5-10	NW	0.6	ND	pc.	>1.0
10 Apr	2344	E	2.5	2.5	2.5	SE	5-10	N	0.3-0.6	ND	clear	
10 Apr	1456	W	2.0	2.0	1.8	NE	10-15	N	0.6	ND	pc.	>1.0
11 Apr	0336	W	1.5	1.5	1.5	SE	10-15	NE	0.6-0.9	SE	pc.	
12 Apr	1535	A	9.5	ND	9.5	SE	5-10	SW	0.3	S	clear	0.2
11 Apr	2345	A	4.0	4.0	4.0	E	10-15	calm		N	ovc.	
12 Apr	1510	B	7.7	ND	7.7	SE	5-10	SW	0.3	S	clear	0.2
11 Apr	2304	B	4.0	4.0	4.0	E	10-15	calm		N	ovc.	
12 Apr	1400	F	8.0	8.0	8.0	SE	5-10	SW	0.3	S	clear	0.2
11 Apr	2155	F	4.0	4.0	4.0	E	10-15	calm		N	ovc.	
8 May	1258	C	12.2	12.2	12.2	SW	25+	SW	0.9	ND	pc.	1.5
10 May	0117	C	12.0	10.0	9.5	S	5-10	calm		S	clear	
8 May	1330	D	11.0	11.0	11.0	SW	20-25	SW	0.9	ND	pc.	1.5
10 May	0025	D	11.6	9.9	9.9	S	5-10	calm		S	clear	
8 May	1429	G	11.0	11.0	11.0	S	25+	SW	0.9	ND	pc.	1.5
9 May	2132	G	13.4	10.5	10.5	S	5-10	calm		S	pc.	
8 May	1458	H	10.9	10.9	10.9	SW	25+	S	0.9	ND	pc.	1.5
9 May	2203	H	13.6	10.2	9.7	S	5-10	calm		S	pc.	
8 May	1158	R	10.3	10.3	10.3	SW	25+	SW	0.9	ND	pc.	1.5
10 May	0154	R	11.4	10.8	10.8	S	5-10	calm		S	clear	
8 May	1645	E	8.0	8.0	8.0	S	5-10	S	1.2-1.8	ND	clear	3.0
9 May	2338	E	10.7	7.9	6.9	S	5-10	calm		S	clear	
8 May	1550	W	8.0	8.0	8.0	S	25+	S	1.2-1.8	ND	clear	3.0
8 May	2252	W	9.0	7.2	6.2	S	5-10	calm		S	clear	
7 May	1830	A	15.0	15.0	14.5	S	20-25	S	0.6	S	clear	>1.0
7 May	2310	A	14.0	13.5	13.0	S	20-25	S	0.6	S	ND	
7 May	1800	B	14.5	14.5	14.0	S	20-25	S	0.6	S	clear	>1.0
7 May	2245	B	13.0	13.0	13.0	S	20-25	S	0.6	S	ND	
7 May	1715	F	13.5	13.5	13.5	S	20-25	S	0.6	S	clear	>1.0
7 May	2140	F	13.5	13.5	12.5	S	20-25	S	0.6	S	ND	

Appendix 13. Continued.

Date	Start time (EST)	Station	Water temp (C) Surface	Mid-depth	Bottom	Wind Dir. from	Speed (mph)	Waves Dir. from	Ht. (m)	Current (Dir. from)	Weather	Secchi disc (m)
1979												
12 Jun	1321	C	17.0	16.0	16.5	NW	5-10	NW	0.3	N	clear	2.5
13 Jun	0328	C	14.8	13.8	13.0	SE	0-5	SE	0.3	ND	ND	
12 Jun	1352	D	17.0	16.0	15.0	N	5-10	NW	0.3	N	clear	3.0
13 Jun	0235	D	14.8	13.1	12.0	SE	5-10	SE	0.3	ND	ND	
12 Jun	1446	G	17.2	16.5	16.3	NE	5-10	NE	0.3	N	clear	3.0
12 Jun	2112	G	16.0	15.0	14.0	SE	0-5	SE	0.3	ND	ND	
12 Jun	1520	H	16.2	15.5	14.5	NE	5-10	NE	0.3	N	clear	3.0
13 Jun	0010	H	15.2	14.3	13.0	SE	5-10	SE	0.3	ND	ND	
12 Jun	1215	R	17.4	17.2	16.2	NW	5-10	NW	0.3	N	clear	3.0
13 Jun	0402	R	14.3	13.5	13.5	SE	0-5	SE	0.3	ND	ND	
12 Jun	1704	E	16.0	11.2	11.2	NE	5-10	NE	0.3	N	clear	4.0
13 Jun	0146	E	16.0	15.0	11.2	SE	10-15	SE	0.3	ND	ND	
12 Jun	1610	W	16.0	11.5	10.0	NE	10-15	NE	0.4	N	clear	4.0
13 Jun	0100	W	16.0	13.0	11.8	SE	5-10	SE	0.3	ND	ND	
11 Jun	1745	A	18.5	ND	18.0	N	0-5	N	0.4	N	clear	> 1.0
12 Jun	0100	A	16.5	ND	17.0	var.	0-5	var.	0.2	N	clear	
11 Jun	1707	B	18.5	ND	18.0	N	0-5	N	0.4	N	clear	> 1.0
12 Jun	0025	B	16.5	ND	17.0	var.	0-5	var.	0.2	N	clear	
11 Jun	1525	F	18.0	ND	17.0	N	0-5	N	0.4	N	clear	> 1.0
11 Jun	2300	F	17.0	ND	17.5	var.	0-5	var.	0.2	N	clear	
10 Jul	1313	C	19.0	17.5	17.5	calm		calm		ND	clear	4.8
11 Jul	0002	C	21.1	17.7	17.2	SE	5-10	S	0.2	0	pc.	
10 Jul	1345	D	19.0	17.5	17.2	calm		calm		ND	clear	4.0
10 Jul	2322	D	21.0	18.2	17.0	SE	5-10	S	0.2	0	pc.	
10 Jul	1441	G	20.0	18.5	18.5	calm		calm		ND	clear	4.8
10 Jul	2025	G	22.7	17.8	17.1	SE	0-5	calm		0	clear	
10 Jul	1511	H	18.8	18.0	17.5	calm		calm		ND	clear	5.0
10 Jul	2054	H	21.8	17.5	16.5	SE	0-5	calm		ND	clear	
10 Jul	1211	R	19.0	18.0	18.0	calm		calm		ND	clear	4.5
11 Jul	0036	R	20.8	19.0	16.8	S	5-10	S	0.2	0	pc.	
10 Jul	1657	E	20.0	15.0	12.0	calm		calm		ND	clear	7.1
10 Jul	2238	E	20.5	17.4	13.1	SE	5-10	calm		0	clear	
10 Jul	1604	W	20.0	15.0	13.0	calm		calm		ND	clear	7.3
10 Jul	2143	W	20.5	16.0	15.0	SE	0-5	calm		0	clear	
11 Jul	1610	A	25.5	ND	22.5	calm		calm		S	clear	> 1.0
11 Jul	2300	A	21.4	ND	21.4	calm		calm		ND	clear	
11 Jul	1515	B	25.3	ND	22.5	calm		calm		S	clear	> 1.0
11 Jul	2218	B	21.7	ND	21.3	calm		calm		ND	clear	
11 Jul	1410	F	24.0	ND	23.5	calm		calm		S	clear	> 1.0
11 Jul	2115	F	22.0	ND	21.5	calm		calm		ND	clear	
8 Aug	1305	C	23.5	23.5	23.8	NW	5-10	NW	0.6	N	clear	4.2
16 Aug	2205	C	21.0	19.5	19.1	NE	5-10	var.	0.3	ND	ovc.	
8 Aug	1336	D	24.2	23.0	23.0	NW	5-10	NW	0.6	N	clear	4.0
16 Aug	2131	D	21.5	19.5	19.1	NE	5-10	var.	0.3	ND	ovc.	
8 Aug	1430	G	24.0	23.7	23.7	NW	5-10	NW	0.6	N	pc.	4.5

Appendix 13. Continued.

Date	Start time (EST)	Station	Water temp (C) Surface	Mid-depth	Bottom	Wind Dir. from	Speed (mph)	Waves Dir. from	Ht. (m)	Current (Dir. from)	Weather	Secchi disc (m)
1979												
16 Aug	2307	G	19.7	19.7	19.1	NE	5-10	var.	0.3	NW	ovc.	
8 Aug	1501	H	23.8	22.8	22.4	N	5-10	NW	0.6	N	clear	4.0
16 Aug	2349	H	19.5	19.5	19.0	NE	5-10	var.	0.3	ND	ovc.	
8 Aug	1245	R	24.5	24.5	24.5	NW	5-10	NW	0.6	N	clear	3.0
16 Aug	2031	R	20.8	20.8	18.8	E	5-10	var.	0.3	ND	ovc.	
8 Aug	1553	E	22.5	14.8	7.5	N	5-10	NW	0.6-0.9	N	clear	7.0
17 Aug	0108	E	19.5	19.5	19.5	E	10-15	SE	0.3-0.9	ND	ovc.	
8 Aug	1649	W	22.0	10.0	7.0	N	0-5	N	0.6	N	clear	7.5
17 Aug	0019	W	20.0	19.7	19.7	E	5-10	SE	0.3-0.6	ND	ovc.	
8 Aug	1720	A	26.0	26.0	26.0	N	15-20	NW	0.6-0.9	N	pc.	>1.0
8 Aug	0035	A	23.7	ND	23.7	SE	0-5	var.	0.3	S	clear	
8 Aug	1645	B	25.6	25.3	25.0	N	15-20	NW	0.6-0.9	N	pc.	1.5
7 Aug	2350	B	23.0	ND	23.0	SE	0-5	var.	0.3	S	clear	
8 Aug	1540	F	25.1	25.1	25.1	N	15-20	NW	0.6-0.9	N	pc.	1.5
7 Aug	2225	F	24.1	ND	23.8	SE	0-5	var.	0.3	S	clear	
12 Sep	1323	C	20.0	19.5	19.5	W	0-5	W	0.3	ND	ND	5.0
11 Sep	2131	C	20.1	19.8	19.0	SE	5-10	SE	0.3	SE	clear	
12 Sep	1352	D	19.7	19.5	19.5	W	0-5	W	0.3	ND	clear	5.0
11 Sep	2048	D	21.5	20.0	18.0	SE	5-10	SE	0.3	SE	clear	
12 Sep	1448	G	20.0	19.5	19.5	W	0-5	W	0.3	ND	pc.	4.5
11 Sep	2222	G	20.0	20.0	19.0	SE	10-15	SE	0.3	SE	clear	
12 Sep	1516	H	19.5	19.0	19.0	W	0-5	W	0.3	ND	pc.	5.0
11 Sep	2254	H	20.0	19.5	17.1	E	10-15	E	0.3	SE	clear	
12 Sep	1211	R	19.0	19.0	19.0	W	5-10	W	0.3	ND	clear	5.0
11 Sep	1937	R	21.0	20.5	18.5	E	10-15	E	0.3	SE	clear	
12 Sep	1659	E	20.0	15.0	9.0	W	0-5	W	0.3	ND	pc.	5.0
12 Sep	1607	W	19.0	15.0	11.0	W	0-5	W	0.3	ND	pc.	4.5
11 Sep	2342	W	19.0	19.0	17.0	E	10-15	E	0.4-0.6	SE	clear	
12 Sep	1620	A	23.0	ND	22.4	SE	0-5	var.	0.9	S	clear	>1.0
12 Sep	2400	A	21.4	ND	21.1	SE	0-5	calm		0	clear	
12 Sep	1533	B	21.5	ND	21.0	SE	0-5	var.	0.9	S	clear	>1.0
12 Sep	2320	B	20.8	ND	20.8	SE	0-5	calm		0	clear	
12 Sep	1405	F	20.9	ND	20.5	SE	0-5	var.	0.9	S	clear	>1.0
12 Sep	2230	F	21.0	ND	20.6	SE	0-5	calm		0	clear	
8 Oct	1715	A	16.7	ND	16.7	N	0-5	NW	0.2	N	pc.	>1.0
10 Oct	2254	A	14.2	ND	14.2	S	5-10	W	0.9	0	ovc., rain	
8 Oct	1620	B	16.0	ND	16.0	N	0-5	NW	0.2	N	pc.	>1.0
10 Oct	2205	B	13.8	ND	13.8	S	5-10	W	0.9	0	ovc., rain	
8 Oct	1455	F	14.2	ND	14.2	N	0-5	var.	0.2	N	pc.	>1.0
10 Oct	2055	F	13.2	ND	13.2	S	5-10	SW	0.9	0	ovc., rain	
14 Nov	1530	A	9.0	ND	9.0	SW	5-10	W	0.4	N	pc.	1.5
14 Nov	1945	A	8.9	ND	8.9	SW	5-10	W	0.6	S	ovc.	
14 Nov	1500	B	9.3	ND	9.3	SW	5-10	W	0.4	N	pc.	1.5
14 Nov	1910	B	8.9	ND	8.7	SW	5-10	W	0.6	S	ovc.	
14 Nov	1415	F	7.6	ND	7.6	SW	5-10	W	0.4	N	pc.	1.5
14 Nov	1814	F	7.3	ND	7.3	SW	5-10	W	0.6	S	ovc.	